

## CHAPTER 13

# ORGANIC SUPPORT WEAPONS: M203 AND MACHINE GUNS

This chapter is a continuation of the discussion about weapons. Here you will learn about support weapons available to the Seabees. Information on the 40-mm grenade launcher, M203, the M60 machine gun, the .50-caliber Browning machine gun, and the MK 19, MOD 3, 40-mm, machine gun is provided.

### THE 40-MM GRENADE LAUNCHER, M203

When equipped with a grenade launcher, the M16A1 rifle becomes the 40-mm grenade launcher, M203, and loses its identity as the M16A1 rifle.

The launcher attachment is assembled by a qualified armorer only. As a member of a weapons platoon, you only have the responsibility for the employment, trajectory, method of firing, firing effects, malfunctions, and care and cleaning of the launcher attachment.

The 40-mm grenade launcher, M203, mounted on the M16A1 is shown in figure 13-1. It is a lightweight, compact, breech-loading, pump-action (sliding-barrel), single-shot, manually operated weapon.

The launcher is approximately 16 inches in overall length; it weighs approximately 3.6 pounds loaded and 3 pounds unloaded. Its maximum range is 415 meters, its area target range is 350 meters, and its point target range is 150 meters. The grenade launcher controls and their identifications, as shown in figure 13-2, are discussed in the sections that follow.

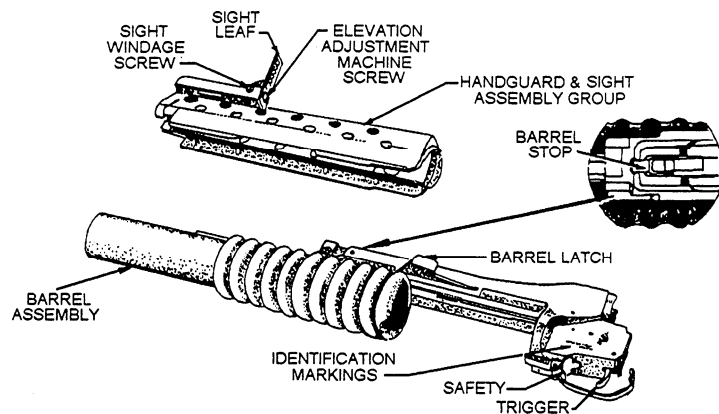


Figure 13-2.—The 40-mm grenade launcher M203, controls, and their identifications.

### HANDGUARD AND SIGHT ASSEMBLY GROUP

The handguard portion of the assembly group is a molded plastic protective cover that fits over the barrel of the M16A1 rifle. The cover prevents the operator from coming into contact with the barrel when it becomes heated from rapid firing. The heat produced by the rifle barrel dissipates through the cooling holes and slots in the cover. The protruding plastic tab on the left side of the cover prevents the barrel latch of the grenade launcher from being accidentally pressed when the weapon is laid on its side.

The sight leaf portion of the assembly group is a metallic folding blade sight. It provides range selection

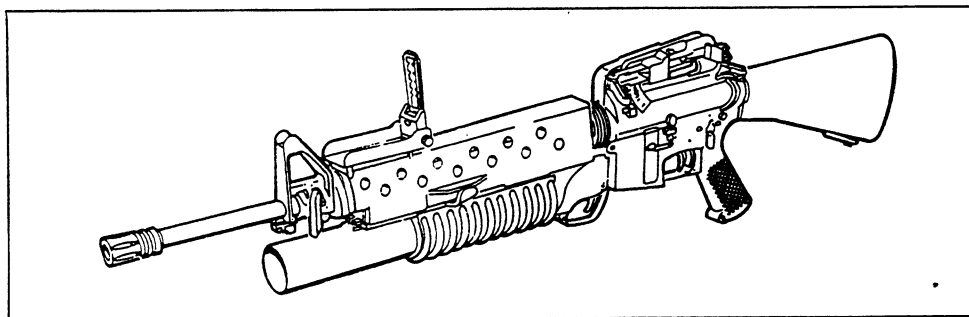


Figure 13-1.—The 40-mm grenade launcher, M203, mounted on the M16A1 rifle.

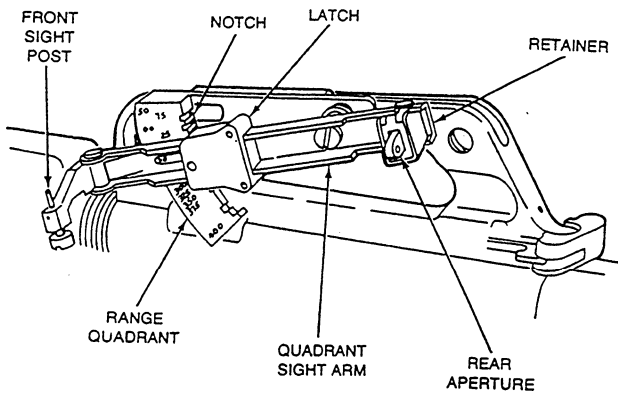


Figure 3-3.—Quadrant sight assembly.

from 50 to 250 meters in 50-meter increments. The windage adjustment screw moves the blade element horizontally to provide windage adjustment capabilities. The elevation adjustment machine screw, when loosened, allows the blade element to be moved vertically, providing elevation adjustment capabilities.

The M203 also has a quadrant sight assembly (fig. 13-3) that connects to the carrying handle of the M16 rifle. It consists of a sight arm, a range selection quadrant, an aperture, and post for sighting operation of the launcher. The range selection quadrant has embossed range graduations from 50 to 400 in 25-meter increments. The 25-meter increments also allow for better accuracy at a greater number of range variations than the quadrant sight (fig. 13-4). For elevation adjustment, turn the front sight post to the right to decrease elevation and to the left to increase elevation.

## NOTE

On elevation, one notch equals 5 meters at 200 meters. For windage adjustment, press the rear sight retainer and move the aperture away from the barrel to move the trajectory of the projectile to the left. Move the aperture toward the barrel to move the trajectory to the right.

## NOTE

On windage adjustment, one notch equals 1.5 meters at 200 meters.

## BARREL ASSEMBLY

The barrel of the barrel assembly is constructed of specially treated and machined aluminum. The barrel extension is a rectangular, chrome-plated steel bar. It attaches to the barrel and provides a means of attaching the barrel to the receiver assembly. The handgrip is a molded plastic corrugated sleeve. When the grenade launcher is being fired, the plastic handgrip allows the operator to hold the launcher without discomfort from the heat.

## RECEIVER ASSEMBLY

The receiver assembly consists of an aluminum receiver that houses the barrel latch, the barrel stop, and the firing mechanism. The receiver assembly attaches to the barrel of the rifle, thereby mounting the grenade launcher to the rifle. The receiver assembly also contains

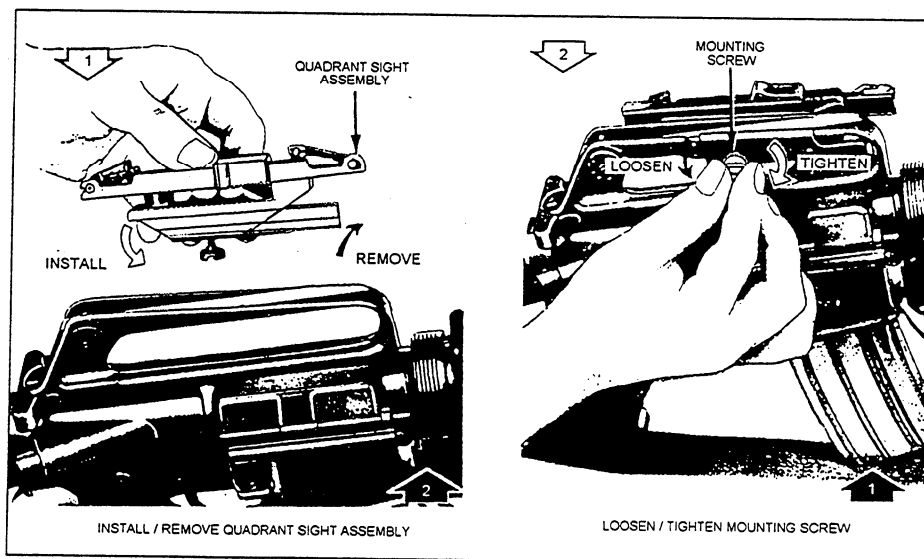


Figure 3-4.—Installation/removal of quadrant sight assembly.

the follower assembly, the trigger, and the safety components that serve to fire or prevent accidental firing of the grenade launcher.

## **BARREL AND BARREL LATCH**

The barrel latch, when depressed, unlocks the barrel so it can be moved forward along the receiver assembly. As the barrel and barrel extension, which is interlocked with the cocking lever, move forward, the cocking lever is forced downward. The cocking lever, in turn, forces the spring-loaded firing pin rearward. At the same time, the spring-loaded follower follows the barrel extension forward. As the barrel continues its forward movement, the barrel extension disengages from the cocking lever; the movement of the follower is restricted by the receiver and the follower holds the cocking lever in the down position. When the barrel is moved rearward, the follower is driven rearward; the cocking lever again engages the barrel extension, and the firing pin moves slightly forward and engages the sear.

## **BARREL STOP**

The barrel stop limits the forward motion of the barrel assembly. This prevents the barrel assembly from sliding off the receiver-assembly barrel track during loading and cocking operations. When depressed, the barrel stop allows the barrel assembly to be removed from the receiver assembly for maintenance purposes.

## **CLEARING THE GRENADE LAUNCHER**

Before clearing the launcher, be sure to point the muzzle clear of all other personnel within the area. Press the barrel latch and slide the barrel forward until the barrel stop is engaged. Inspect the chamber for the possible presence of a round, expended casing, or other obstruction, and remove it if they are present. Be sure the barrel, bore, and chamber are wiped dry with a clean cloth after checking and before firing.

## **LOADING PROCEDURES**

Press the barrel latch and slide the barrel assembly forward until the barrel stop is engaged. Insert a cartridge into the chamber; slide the barrel-assembly sharply rearward until the barrel locks; and then move the safety rearward.

## **FIRING PROCEDURES**

The grenade launcher may be fired from any of the following positions: prone, sitting, kneeling, or standing. For all positions, the firing procedures are as follows:

1. With the grenade launcher loaded, position the weapon and sight.
2. Move the safety to the fire position.
3. Place the butt of the stock firmly against your shoulder. In firing long range from the prone position, place the butt of the stock firmly on the ground. Take aim and squeeze the trigger to fire the weapon.

## **WARNING**

When firing high-explosive (HE) rounds at targets within leaf sight ranges of 50 to 80 meters, you should be in a protected position. Also, targets within an 80-meter radius of unprotected friendly troops should not be engaged. The danger radius of practice rounds is 20 meters. In addition, observe precautions and warnings pertaining to the type of ammunition being used.

## **LEAF SIGHT ZEROING PROCEDURES**

To zero in the grenade launcher leaf sight, you should set up a target at 200 meters. Remember not to perform these procedures at ranges less than 100 meters. The 50-meter mark on the leaf sight blade is marked in red to emphasize that this range is not to be used in the zeroing-in procedures.

Be sure to perform the before-firing preventive maintenance services and the loading procedures as specified. Place the leaf sight blade of the weapon in the upright position. Choose your firing position, preferably a supported prone position. Align the target with the appropriate range increment of the leaf sight blade and the front post sight of the rifle. Fire the weapon, using the firing procedures given. Make any applicable windage or elevation adjustments.

## **NOTE**

Turning the sight windage screw clockwise moves the leaf sight to the left. Raising the leaf sight increases the range, and lowering the leaf sight decreases the range.

When you must adjust for wind, each increment turn of the windage screw equals a 1 1/2-meter adjustment when you are firing on the 200-meter range.

When you must adjust for elevation, each increment turn of the elevation adjustment machine screw equals a 10-meter adjustment when you are firing on the 200-meter range.

Fire three rounds and make the necessary adjustments after each round. When three consecutive rounds land within 5 to 10 meters of the target, the zeroing-in procedures are complete.

### **MISFIRE, HANGFIRE, AND STOPPAGE**

A MISFIRE is a complete failure to fire because of a mechanical failure, not a delay in firing like a hangfire. It is not dangerous, but it must be treated as a hangfire (which is dangerous) until such possibility has been eliminated.

A HANGFIRE is a delay in the functioning of the propelling charge. Wait 30 seconds from the time the charge fails to fire before opening the breech for unloading procedures. Caution is required, as this can be very dangerous. Clear the area of all personnel not needed to correct the hangfire.

A STOPPAGE is any interruption in the cycle of operation caused by faulty action of the weapon or ammunition.

When a weapon fails to fire, the possibility of a misfire or hangfire exists. Therefore, the following precautions must be observed until the round has been removed from the weapon and the cause of the failure determined:

1. Keep the weapon trained on the target and be sure all personnel are clear of the muzzle.

2. Wait 30 seconds from the time the weapon fails to fire before opening the breech for unloading.

3. Exercise extreme caution during unloading procedures; where circumstances permit, either catch the ejected round or reduce the distance of free fall to the ground.

4. After the round has been removed from the receiver, store it separately until you determine whether the round or the firing mechanism is defective. If the round is defective, it must be kept separated from other rounds until it can be disposed of properly. If examination reveals that the firing mechanism is defective, the round may be reloaded and fired after the firing mechanism has been repaired by the armorer.

### **UNLOADING THE LAUNCHER**

To unload the launcher, press the barrel latch and move the barrel forward. The expended casing is automatically extracted and ejected.

### **CLEANING AND LUBRICATING AFTER FIRING**

Clean dust, dirt, and mud from all surfaces of the handguard assembly, the sight assembly, and the receiver assembly with a clean, dry cloth. Remove powder fouling from the heat shield of the handguard using rifle bore cleaner (RBC). Wipe the inside of the barrel with a cloth soaked in rifle bore cleaner. Remove any deposits or residue inside the barrel by using a bore brush.

Press the barrel latch and move the barrel forward until the barrel stop is engaged. Lubricate the barrel assembly track by applying a light coat of semifluid lubricating oil recommended by the armorer. Wipe all exposed metal surfaces with a cloth saturated with the recommended lubricant. Touch up any scratched or worn surfaces with a solid film of lubricant. Before applying the lubricant, wipe the surfaces with a dry-cleaning solvent to ensure they are thoroughly cleaned of all foreign matter. Separate the upper and lower receiver groups on the rifle. With the launcher cocked, remove the backplate and follower, flush inside the trigger housing with rifle bore cleaner, wipe dry, and lubricate with the recommended lubricant. This action should be done only under the supervision of an armorer.

### **GRENADE LAUNCHER AMMUNITION**

The cartridges used with the launcher, as shown in figure 13-5, are fixed types of ammunition that consist of two major assemblies: the cartridge case and the projectile.

Five standard A types of 40-mm ammunition are used with the launcher: high explosive (HE), high explosive airburst (HE airburst), high explosive smokeless and flashless, high explosive dual purpose (HEDP), and training practice (TP).

These cartridges are ready for use as issued. No prior preparation of the rounds is required other than removal from the packing and insertion into the weapon.

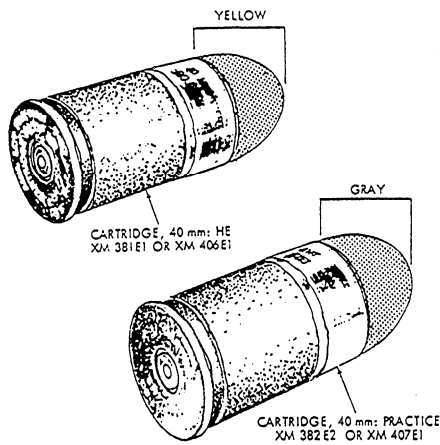


Figure 13-5.—Cartridges used with grenade launcher, M203.

## SAFETY PRECAUTIONS

The safety precautions that should be observed to prevent injury to personnel using the launcher and/or damage to the ammunition are given below.

1. The cartridges should be free of sand, mud, moisture, frost, snow, ice, grease, or other foreign matter before insertion into the weapon.
2. Do not fire ammunition that is corroded.
3. Take care at all times to protect the primer and the aluminum give (diagonal rib on the round). They are easily dented and should be protected from hard knocks or blows. The plastic inserts used in the packing of these rounds serve this purpose.
4. Do not use cartridges that have been damaged or those having an indication of separation.
5. Do not fire ammunition unless it has been identified by its lot number and grade.
6. Misfires and hangfires must be handled as previously stated in the above sections.
7. Do not fire at targets within an 80-meter radius of friendly troops or yourself, unless there is adequate protection from fragment hazards.
8. Do not fire canopy smoke cartridges in such a way that the falling ignited projectile could descend upon friendly troops, causing injury to friendly personnel or damage to their material or both.

## M60 MACHINE GUN

The M60 machine gun is one of two fully automatic weapons in the Seabee battalion. The other being the 50-caliber M2 machine gun, which is discussed later in this chapter.

The M60 is used to support the rifle fire teams in a unit. The M60 is capable of delivering a heavy volume of controlled and accurate fire, both in offensive and defensive situations. Its capability is more than that of other individual small arms. The M60 machine gun can effectively engage predetermined targets under all conditions of visibility. Naval Construction Battalion fire plans are made around the final protective fires of the M60 machine gun.

## CHARACTERISTICS OF THE M60 MACHINE GUN

The M60 machine gun is an air-cooled, belt-fed, gas-operated automatic weapon. The weapon features fixed headspace that permits rapid changing of the barrel. Two barrels are issued with each weapon, and an experienced gun crew can change the barrel in a few seconds.) The M60 fires from the open-bolt position. Ammunition is fed into the gun by a disintegrating metallic split-link belt. The gas from the previously fired round provides energy to cock, load, and fire the next round. The bolt must be to the rear before the round can be picked up and fed into the chamber. It fires the standard 7.62-(North Atlantic Treaty Organization) cartridge at a sustained rate of 100 rounds per minute with six to eight rounds per burst, for 10 minutes; then you must change the barrel. On rapid fire, it can deliver up to 200 rounds per minute for 2 minutes before the barrel must be changed. The cyclic rate of fire is 550 to 600 rounds per minute, with a barrel change required every minute. Muzzle velocity is 2,700 feet per second, with a maximum range of 3725 meters. The maximum effective range is 1100 meters.

## GENERAL DATA

Ammunition . . . . .	7.62-mm ball, tracer, blank, and dummy
Length . . . . .	43.5 inches
Weight . . . . .	23.2 pounds
Weight of M122 tripod with traversing and elevating mechanism, pintle, and platform . . . .	19.5 pounds
Weight of spare barrel case, complete . . . . .	13.5 pounds (rubberized case) 16.5 pounds (canvas case)
Height of gun on tripod . .	16.5 inches

## Rates of fire:

Sustained . . . . .	100 rounds per minute
Rapid . . . . .	200 rounds per minute
Cyclic . . . . .	550 to 600 rounds per minute
Maximum range . . . . .	3725 meters (approximate)
Maximum effective range . . . . .	1100 meters
Elevation, tripod, controlled . . . . .	265 mils
Depression, tripod, controlled . . . . .	200 mils
Elevation, tripod, free . . . . .	445 mils
Depression, tripod, free . . . . .	445 mils
Traverse, tripod, traversing bar . . . . .	875 mils (425 left and 450 right)
Traverse, tripod, traversing handwheel . . . . .	100 mils
Traverse, free . . . . .	6400 mils

The external nomenclature of the M60 machine gun is shown in figure 13-6.

The M60 has a front sight permanently affixed to the barrel. The rear sight leaf, as shown in figure 13-7, is mounted on a spring type of dovetail. It can be folded forward horizontally when the gun is to be moved. The range plate on the sight leaf is marked for each 100 meters, from 300 meters to the maximum effective range of 1100 meters. Range changes may be made by using either the slide release or the elevating knob. The slide release is used for making major changes in elevation. The elevating knob is used for fine adjustments, such as those made during zeroing. Four clicks on the elevating knob equal a 1-mil change in elevation. The sight is adjustable for windage 5 mils right and left of zero. The windage knob is located on the left side of the sight. One click on the windage knob equals a 1-mil change of deflection.

A safety lever is located on the left side of the trigger housing. It has an S (safe) and an F (fire) position. On the S position, the bolt cannot be pulled to the rear or released to go forward. The cocking handle on the right

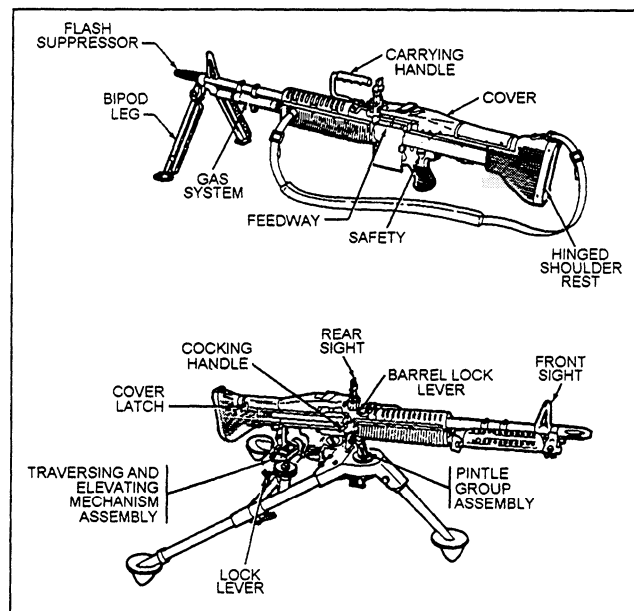


Figure 13-6.—External nomenclature of the M60 machine gun.

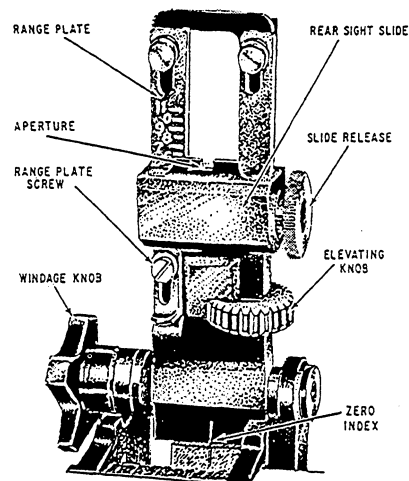


Figure 13-7.—The rear sight.

side of the gun is used to pull the bolt to the rear. Always remember that the cocking handle must be returned manually to its forward position each time the bolt is manually pulled to the rear.

The flash suppressor is affixed to the muzzle of the barrel. The ribs of this suppressor vibrate during firing and dissipate flash and smoke.

The M60 can be effectively fired from the integral bipod mount (fig. 13-6). The hinged shoulder rest provides support for the rear of the gun. The movable carrying handle provides a method for carrying the gun

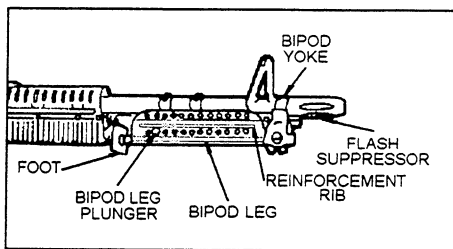


Figure 13-8.—Bipod mount.

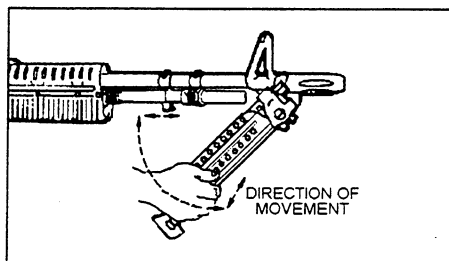


Figure 13-9.—Lowering the bipod leg.

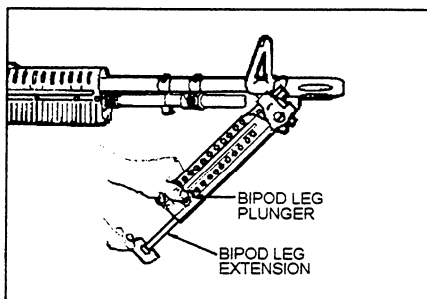


Figure 13-10.—Adjusting the bipod leg extension to lengthen the leg.

short distances and can be positioned out of the gunner's line of sight.

The bipod mount is an integral part of the barrel group. The bipod yoke fits around the barrel and is held in position by the flash suppressor, as shown in figure 13-8. To lower a bipod leg, pull it to the rear (compressing the lock spring) and push it downward, as shown in figure 13-9. The leg automatically y locks when in the down position.

To lengthen a bipod leg, pull down on the foot, as shown in figure 13-10. The bipod leg plunger engages a notch in the bipod leg extension and holds it in the desired position. To shorten the bipod leg, depress the bipod leg plunger and push upon the bipod foot.

The M122 tripod mount provides a stable and durable mount for the M60 machine gun. Firing the gun from the tripod permits a high degree of accuracy and control.

The M122 tripod mount consists of the tripod assembly, the traversing and elevating mechanism, and the pintle and platform group.

The tripod mount consists of a tripod head with a pintle bushing and pintle lock, one front and two rear legs, and a traversing bar, as shown in figure 13-11. The traversing bar connects the two rear legs and supports the traversing and elevating mechanism. Engraved on the bar is a scale that is divided into 100-mil major divisions and 13-mil subdivisions, 450 mils to the left and 425 to 430 mils to the right of center. A sliding sleeve

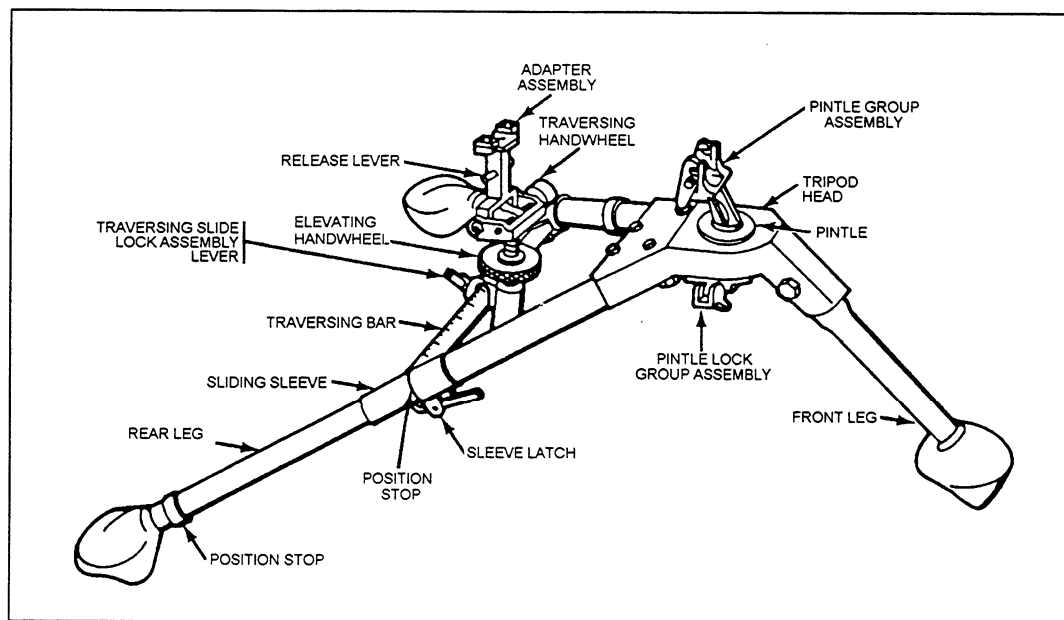


Figure 13-11.—Machine gun tripod mount, M122.

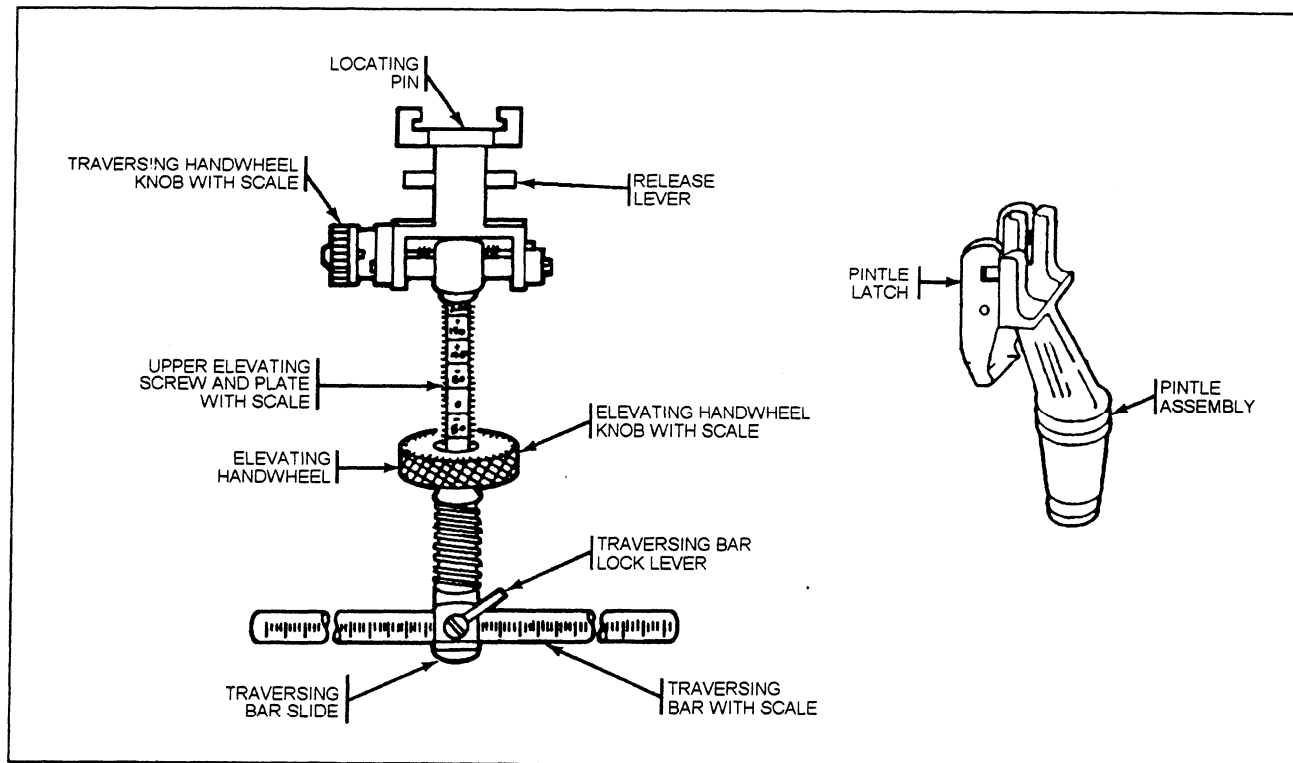


Figure 13-12.—Traversing and elevating mechanism, pintle, and platform group.

connects the traversing bar and a rear leg to permit the legs to fold. Position stops are provided to stop the traversing bar in the open or closed positions. The sleeve latch on the right rear leg secures the traversing bar when in the open position. (See fig. 13-11.)

The traversing and elevating mechanism shown in figure 13-12 consists of (1) the elevation adapter that connects to the mounting plate on the bottom of the receiver and (2) the traversing handwheel that has a rill-click device built into it. One click equals a 1-mil change. Engraved on the traversing handwheel is a scale that is divided into 1-mil increments for a total of 25 mils. Use of the traversing mechanism allows the gun to be traversed approximately 100 mils (50 mils right and left of center).

The elevating handwheel has a mil-click device built into it. One click equals a 1-mil change. Engraved on the handwheel is a scale divided into 5-mil major divisions and 1-mil subdivisions. The scale is read directly from the indicator. The upper elevating screw has the elevating screw plate, which is graduated into 50-mil increments. There are 200 mils above and 200 mils below the zero mark for a total of 400 mils in elevation change.

The traversing slide lock lever allows rapid lateral adjustments along the traversing bar. Readings are taken from the left side of the slide.

The pintle and platform group shown in figure 13-12 consist of the gun platform and the pintle, which is secured to the tripod assembly.

To mount the gun, (1) lock the pintle and platform group into the pintle bushing, as shown in figure 13-13;

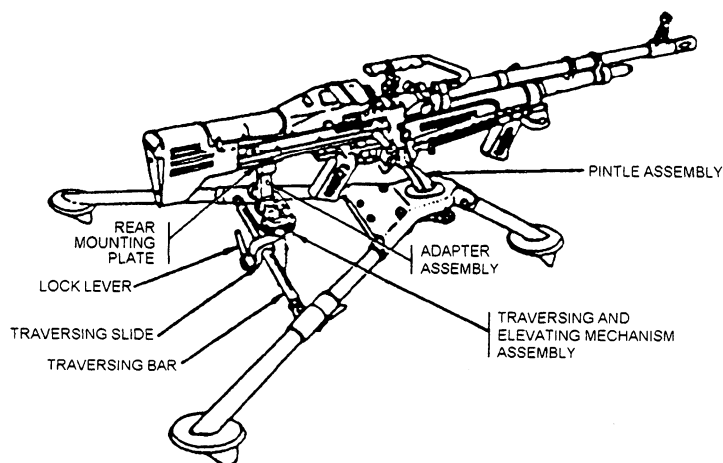


Figure 13-13.—Gun in relation to the tripod.



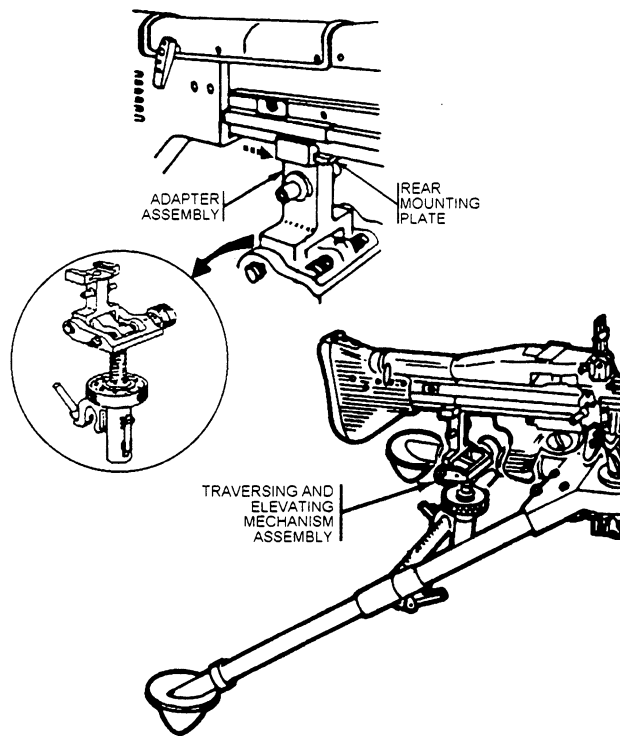


Figure 13-14.—Attaching the traversing and elevating mechanism.

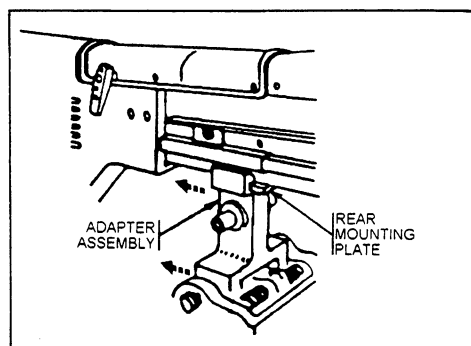


Figure 13-15.—Removing the traversing and elevating mechanism.

(2) position the front locating pin (in the forearm assembly) in the front mounting lug; and (3) lower the receiver so the rear locking pin snaps under the platform latch.

To attach the traversing and elevating mechanism, take the following steps: (1) mount the gun on the tripod, release the platform lock, and raise the rear of the gun; (2) place the mounting plate recess on the rear of the mounting plate and push it forward, as shown in figure 13-14 (the adapter pin automatically locks into position in the bottom of the mounting plate); and (3) lower the rear of the gun, place the traversing slide (with the traversing slide-lock lever to the rear) on the traversing bar, and lock into position.

To remove the traversing and elevating mechanism, release the traversing slide-lock lever and raise the rear of the gun. Pull down on the adapter pin release and pull the mechanism straight back off the mounting plate, as shown in figure 13-15.

Return the platform lock to the down position. Stand to the left of the gun and grasp the carrying handle with your left hand. With your right hand, depress the platform latch and raise the rear of the gun slightly, thus removing the rear locking pin from under the platform latch. Place your right hand on the top of the stock, pull the gun slightly to the rear, pushdown on the stock, and lift the gun from the mount.

## OPERATION

The M60 machine gun is loaded, fired, unloaded, and cleared in the OPEN-BOLT position. The safety must be placed in the F (Fire) position before the bolt can be pulled to the rear.

To load the machine gun, check to make sure the safety is in the F position. Using the cocking handle, pull the bolt to the rear. When the bolt is held to the rear by the sear, return the cocking handle to the forward position and place the safety in the S (Safe) position. Raise the cover to ensure that the feed tray, receiver, and the chamber are clear. Place the first round of the belt in the feed tray groove and close the cover, ensuring that the round remains in the feed tray groove.

To unload the machine gun, pull the bolt to the rear, place the safety in the S position, and return the cocking handle to the forward position. Raise the cover and remove any ammunition or links from the feed tray.

To clear the machine gun, pull the cocking handle to the rear, place the safety in the S position, and push the cocking handle forward. Then raise the cover and inspect the chamber; if it is clear, close the cover and place the safety in the F position; then pull the trigger. After the bolt has gone forward, place the safety in the S position.

## FUNCTIONING

By having a basic knowledge of how the machine gun functions, you should be able to recognize and correct stoppages that occur during firing.

The machine gun is designed to function automatically as long as ammunition is fed into the chamber and the trigger is held to the rear. Each time a round is fired, the parts of the machine gun function in

a certain sequence. The sequence of operation is known as the cycle of functioning.

The cycle of functioning is divided into eight basic steps that are listed below in the order they occur; however, more than one step may occur at the same time.

**FEEDING**—A round is positioned into the feed tray groove.

**CHAMBERING**—A round is stripped from the belt and placed in the chamber.

**LOCKING**—The bolt is locked inside the barrel socket.

**FIRING**—The firing pin strikes and detonates the primer of the cartridge.

**UNLOCKING**—The bolt is unlocked from the barrel socket.

**EXTRACTING**—The empty case is pulled from the chamber.

**EJECTING**—The empty cartridge case is thrown from the receiver.

**COCKING**—The sear engages the sear notch.

## **MALFUNCTIONS**

A malfunction is a failure of the gun to function satisfactorily. Defective ammunition or improper operation of the gun by either you or one of your crew members is not considered a malfunction of the gun. Two of the more common malfunctions of the M60 machine gun are sluggish operation and a runaway gun. Sluggish operation of the gun is usually caused by excessive dirt or carbon, lack of proper lubrication, burred parts, or excessive loss of gas. Clean and lubricate the gun; inspect for burred parts and have them replaced as necessary by the armorer. Excessive loss of gas is usually caused by a loose or missing gas-port plug.

The best method of stopping a runaway gun depends on many factors. Some of these factors are the amount of ammunition remaining in the belt, how the gun is mounted, and whether an assistant gunner is present. For example, in assault firing with the bandoleer attached to the gun, you will continue to move forward, keeping the gun on target until the ammunition is expended. In other types of firing, the primary consideration is keeping the gun on target; however, either you or the assistant gunner may be able to stop the gun by twisting or breaking the belt to stop the feeding.

When you have ceased firing the gun, field-strip it and check the sear and sear notch for excessive wear.

Check the gas system to ensure that the gas-port plug, gas-cylinder extension, and gas-cylinder nut are tight. Clean the operating rod tube. Replace parts as necessary.

## **STOPPAGES**

A stoppage is any interruption in the cycle of functioning caused by a faulty action of the gun or ammunition. Stoppages are classified by the relationship to the cycle of functioning. Table 13-1 shows the types of stoppages, their causes, and the corrective action to be taken.

## **IMMEDIATE ACTION**

Immediate action is the action taken to reduce the stoppage without investigating the cause. This action must be accomplished within 10 seconds, including waiting time, when the barrel is hot enough to cause a cook off. A cook off is the ignition of a round caused by the heat of the chamber without the firing pin striking the primer of the cartridge. One hundred and fifty rounds fired in a 2-minute period may heat the barrel sufficiently to cause a cook off.

If a stoppage occurs, wait 5 seconds. (The bolt must remain forward for the first 5 seconds because of the possibility of a hangfire.)

After the 5-second wait, raise the cover and remove the ammunition belt and the links from the feed tray.

Pull the cocking handle to the rear, making sure the sear engages the sear notch in the operating rod; close the cover immediately; then return the cocking handle to its forward position.

During the retraction of the bolt, observe the round being extracted and ejected. If the round is NOT extracted, pull the trigger, attempting to fire the round. If the round does not fire and the barrel is hot, wait at least 5 minutes with the bolt in the forward position to prevent damage or injury to personnel in the event of a cook off. After the 5-minute wait, remove the round by using a cleaning rod inserted from the muzzle end of the gun.

When the round is extracted or when a round is removed from the chamber, inspect the gun and ammunition to determine the cause of the stoppage.

After cleaning the machine gun, reload, rezero in on the target, and attempt to fire.

Table 13-1.—Malfunctions or Stoppages, Their Causes, and Corrective Action

Malfunction or stoppage	Probable cause	Corrective action	Malfunction or stoppage	Probable cause	Corrective action
Failure to feed.	Gas pressure insufficient . . . .	Clean gas port.	Failure to extract.	Ammunition faulty . . . . .	Replace ammunition.
	Feed pawl or feed pawl spring defective . . . . .	Return to Armorer.		Chamber dirty . . . . .	Clean or change barrel.
	Front and rear cartridge guides defective . . . . .	Return to Armorer.		Operating rod drive spring weakened or damaged . . . .	Armorer replaces spring.
	Cover latch defective . . . . .	Return to Armorer.		Extractor or spring broken	Armorer replaces spring.
	Feed lever cam spring defective . . . . .	Return to Armorer.		Short recoil . . . . .	Clean gas port, operating rod tube, and lubricate.
	Cam roller defective . . . . .	Return to Armorer.		Gas piston installed backwards . . . .	Install properly.
	Lubrication inadequate . . . . .	Apply lubricant.		Short recoil . . . . .	Clean gas port.
	Ammunition or link defective . . . .	Insert new ammunition or link.		Ejector or ejector spring frozen or damaged . . . .	Clean or armorer replaces port.
	Ammunition belt installed wrong. . . .	Reverse belt with open portion of link down.		Sear broken . . . . .	Return to armorer.
	Operating rod spring damaged or weakened . . . .	Armorer replaces spring.		Operating rod sear notch worn . . . . .	Return to armorer.
Failure to chamber.	Obstruction in receiver . . . . .	Remove obstruction.	Failure to eject.	Sear plunger or spring broken or defective. . . .	Return to armorer.
	Ruptured cartridge case . . . . .	Remove cartridge case.		Obstruction in receiver . . . . .	Clear as required.
	Caked carbon in gas cylinder . . . . .	Remove carbon.		Short recoil Sear broken or worn . . . . .	Clean gas port.
Failure to fire.	Caked carbon in receiver . . . . .	Remove carbon.	Runaway gun.	Sear notch on operating rod worn . . . . .	Return to armorer.
	Round damaged . . . . .	Remove round.		Excessive friction . . . . .	Clean and lubricate.
	Firing pin damaged or broken . . . . .	Armorer replaces firing pin.	Sluggish operation.	Excessive loss of gas . . . . .	Tighten or replace gas port plug.
	Firing pin spring damaged or broken . . . . .	Armorer replaces spring.			

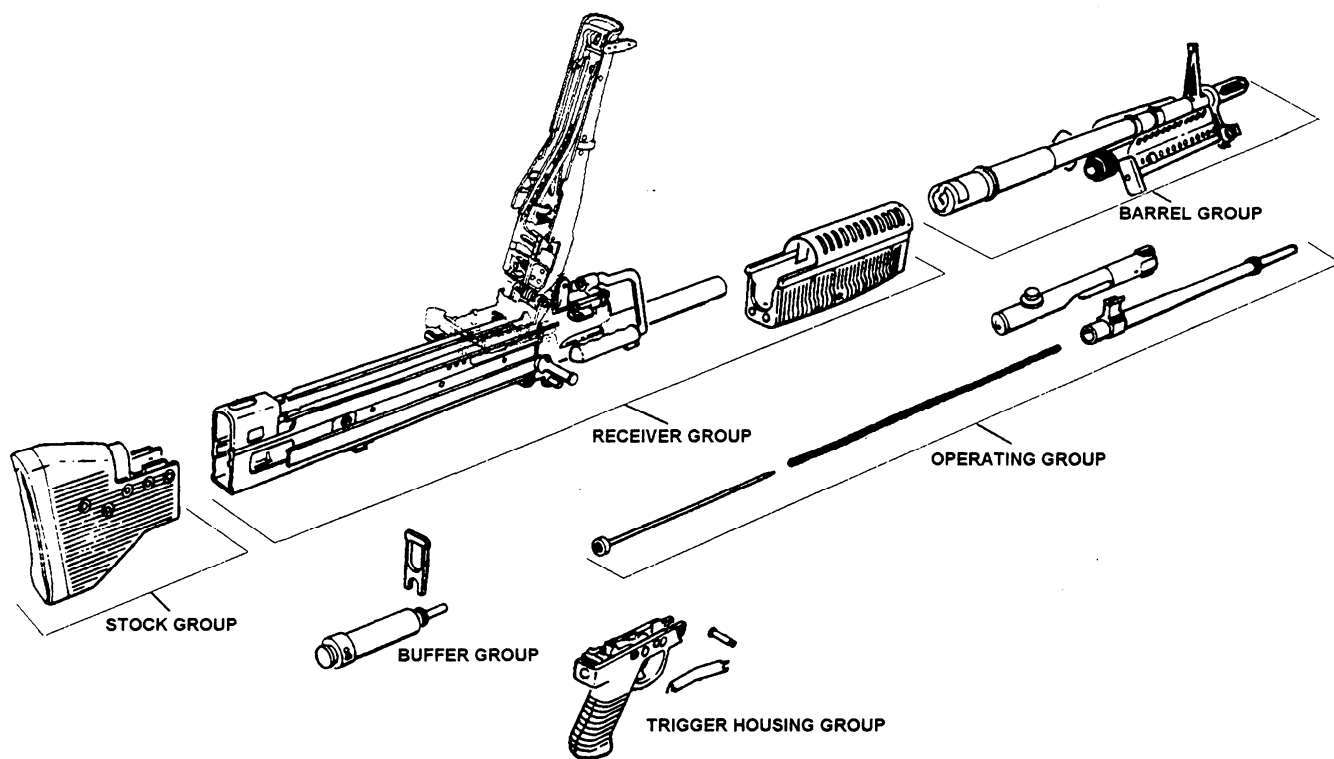


Figure 13-16.—M60 machine gun disassembled into six major groups.

## CLEANING AND LUBRICATING

Immediately after firing and on 2 consecutive days thereafter, thoroughly clean the bore, the chamber, and the parts that have become powder-fouled with bore cleaner. Do not wipe it dry. On the third day after firing, clean the M60 with bore cleaner, wipe it dry, then lightly coat it with oil.

Weekly thereafter when the M60 is not being fired, clean the bore and chamber with bore cleaner, wipe it dry, and then oil it. The rest of the machine gun should be cleaned with a dry-cleaning solvent immediately after firing and weekly thereafter. Wipe it dry and oil it.

Do not clean the inside of the M60 gas system unless blank ammunition has been used or unless the gun fires sluggishly after all other reasons for sluggishness have been checked.

Lubricate the machine gun with a general-purpose lubricant when operating in an average climate. For hot, humid climates, inspect the M60 more frequently for signs of rust. Keep it free of moisture and lightly oiled with a special general-purpose lubricant. When exposed to salt air, high humidity, or water, clean and oil the M60 more frequently to remove contaminated lubricants.

## ACTION BEFORE AND DURING FIRING

Before firing, wipe the bore dry, inspect the weapon, and ensure the M60 is properly lubricated.

During firing, change the barrels as prescribed for the number of rounds fired in a given period of time, periodically inspecting the M60 to ensure it is properly lubricated; then follow the procedures given when malfunctions or stoppages occur.

## FIELD STRIPPING

The M60 machine gun can be disassembled and assembled without the use of force. With exception of the barrel group, all disassembly can be accomplished with a cartridge or some other pointed object.

As you disassemble the machine gun, be sure to place the parts in the order in which they were removed on a clean, flat surface, such as a table or workbench. This reduces the possibility of losing parts and aids in assembling the gun.

A general disassembly (field stripping), as shown in figure 13-16, and reassembly involve removing and replacing the six major groups. These groups consist of the STOCK GROUP, BUFFER GROUP, OPERATING GROUP, TRIGGER HOUSING GROUP, BARREL GROUP, and RECEIVER GROUP.

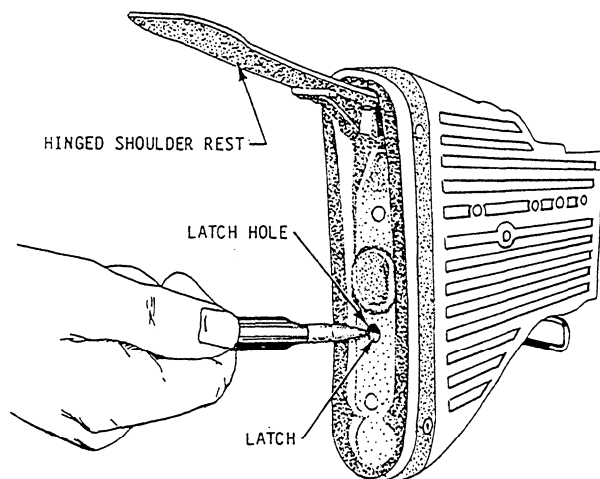


Figure 13-17.—Releasing the stock latch.

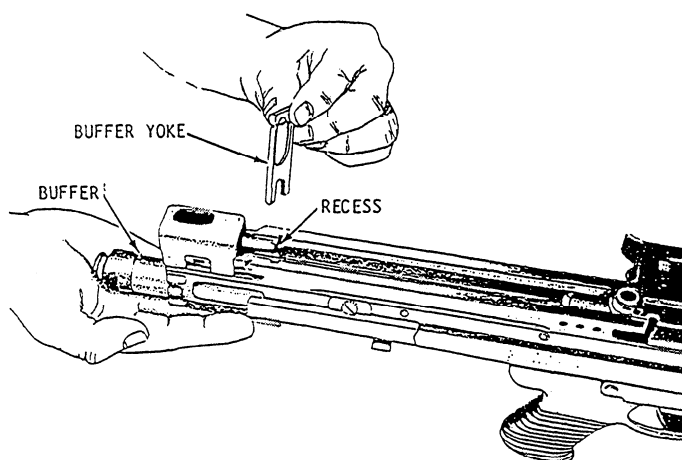


Figure 13-18.—Removing the buffer group.

General disassembly begins with the bolt forward, the cover closed, and the safety in the S position. Before the weapon is disassembled, be sure it has been cleared as outlined in previous sections of this chapter.

### Removing the Stock Group

Raise the hinged shoulder rest and insert the nose of a cartridge into the latch hole, as shown in figure 13-17. With the latch depressed, remove the stock by pulling it directly to the rear.

### Removing the Buffer Group

The M60 buffer group consists of the buffer yoke and the buffer, as shown in figure 13-18. Hold the palm of your hand against the exposed buffer and press lightly, as shown in the figure. Remove the buffer yoke from the top of the receiver and withdraw the buffer

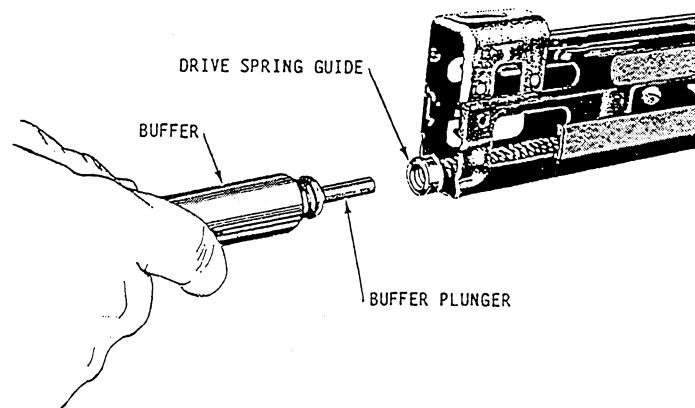


Figure 13-19.—Separating the buffer group (buffer plunger) from the operating group (drive spring guide).

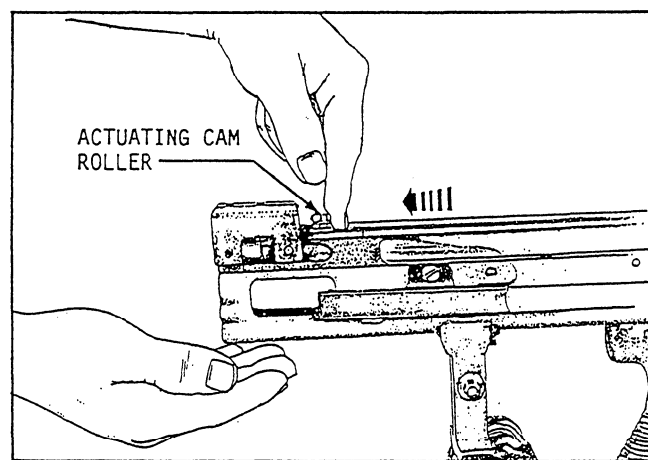


Figure 13-20.—Pull the operating rod and bolt to the rear by pulling on the cam roller.

slowly. Allow the drive spring to expand until the end of the drive spring is exposed at the rear of the receiver, as shown in figure 13-19. Pull the buffer plunger from the spring guide.

### Removing the Operating Group

The operating group of an M60 consists of the operating rod, bolt, drive spring, and drive spring guide. Pull the drive spring guide and spring from the receiver and separate them. With the left hand, grasp the pistol grip and pull the cocking handle to the rear until the bolt is separated from the barrel socket. Continue to pull the operating rod and bolt to the rear by pulling on the cam roller, as shown in figure 13-20.

When the operating rod and bolt are exposed approximately 4 inches to the rear of the receiver, grasp

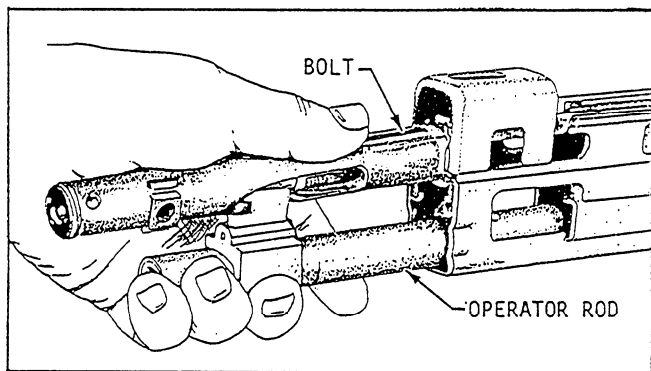


Figure 13-21.—Withdrawing the operating group from the receiver.

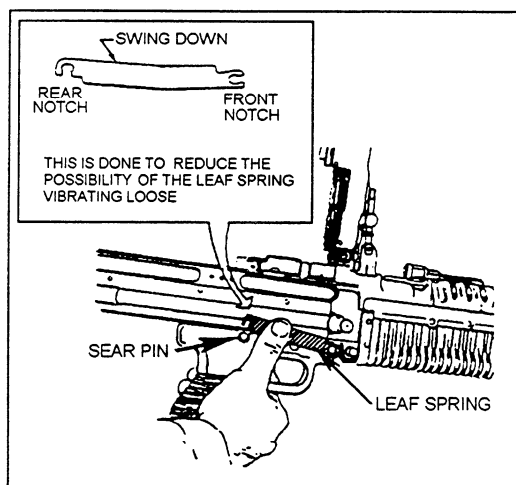


Figure 13-22.—Removing the leaf spring.

them securely to prevent the bolt from rotating and remove them from the receiver, as shown in figure 13-21. Relax the grip and allow the bolt to rotate slowly. Do not separate the bolt from the operating rod.

### Removing the Trigger Housing Group

The M60 trigger housing group consists of the trigger housing assembly (trigger housing, sear, sear plunger, sear plunger spring, trigger pin, and trigger), trigger housing pin, and the leaf spring.

Press in on the front of the leaf spring and rotate the front end down to clear it from the trigger housing pin, as shown in figure 13-22. Pull forward to disengage the rear notch from the sear pin. Remove the trigger housing pin by pushing it to the left.

Slide the trigger housing group slightly forward, rotate the front of the housing down, and remove it, as shown in figure 13-23.

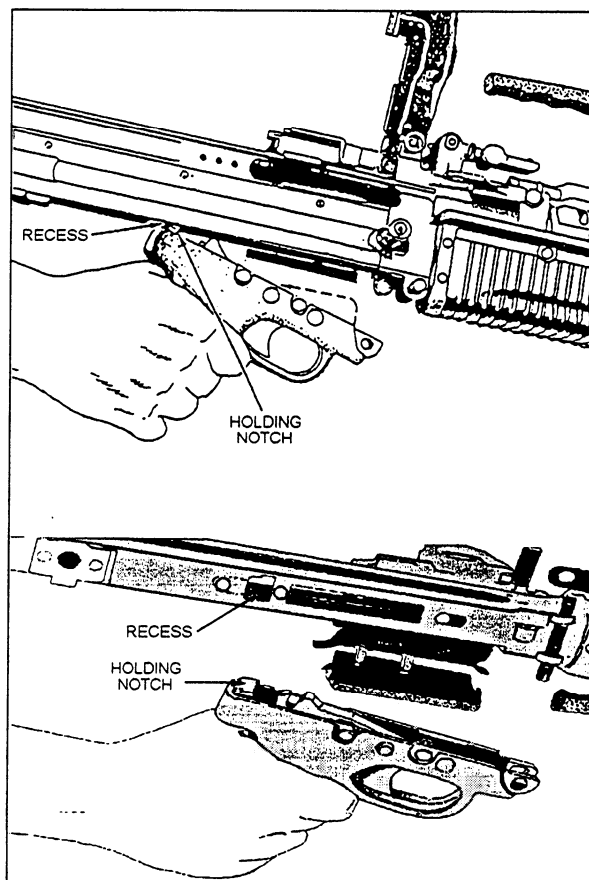


Figure 13-23.—Removing the trigger housing group.

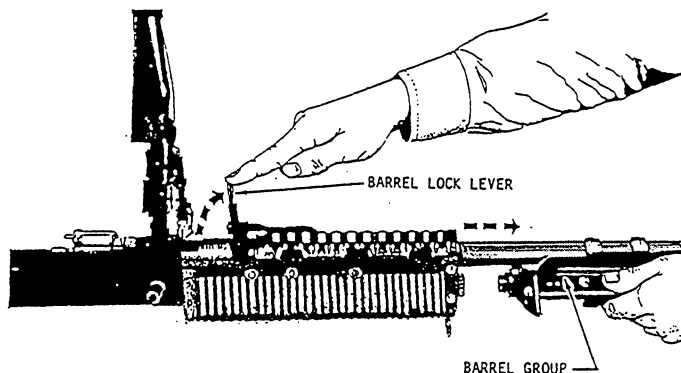


Figure 13-24.—Removing the barrel group.

### Removing the Barrel Group

The M60 barrel group consists of the barrel, flash suppressor, front sight bipe assembly, and gas cylinder. Raise the barrel lock lever to the vertical position and remove the barrel group by pulling it to the front, as shown in figure 13-24.

### Removing the Receiver Group

The M60 receiver group consists of the receiver, forearm assembly, rear sight, cover, feed tray, and

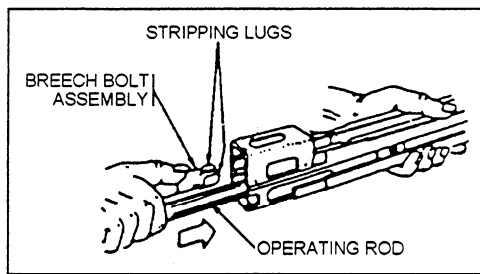


Figure 13-25.—Inserting the operating group in the receiver.

carrying handle. General disassembly is completed after removal of the other five groups from the receiver group.

### Replacing the Barrel Group

Ensure the barrel-lock lever on the M60 is in the vertical position (fig. 13-24). Insert the rear of the barrel under the barrel cover and align the gas cylinder nut with its recess in the forearm assembly. Lower the barrel-lock lever.

### Replacing the Trigger Housing Group

Engage the holding notch of the M60 trigger housing in its recess in the bottom of the receiver (fig. 13-23). Rotate the front of the trigger housing up and align the holes of the trigger housing with the mounting bracket on the receiver. Insert the trigger housing pin from the left.

Engage the rear leaf spring with the sear pin (fig. 13-22). Ensure the leaf spring is positioned so the bent portion is pressed against the side of the trigger housing. Rotate the front of the spring up and engage it with the trigger housing pin.

### Replacing the Operating Group

Insert the end of the M60 operating rod into the receiver. Hold the rod with one hand. With your other hand, push forward on the rear of the bolt, causing the bolt to rotate until the locking lugs are in a vertical position, as shown in figure 13-25.

With the cam roller up, push the operating rod and the bolt into the receiver until the end of the operating rod is even with the rear of the receiver, as shown in figure 13-26.

Insert the drive spring guide into the drive spring; then insert the opposite end of the drive spring into the recess of the operating rod (fig. 13-26). Pull the trigger

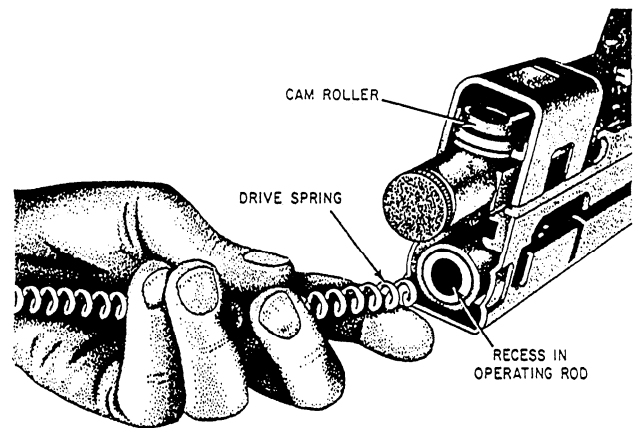


Figure 13-26.—Inserting the drive spring.

and push in the drive spring until the head of the guide is approximately an inch from the receiver (fig. 13-19).

### Replacing the Buffer Group

Insert the buffer plunger into the drive spring guide (fig. 13-19). Push forward on the buffer until the operating rod and bolt go forward fully.

Push in on the buffer until the recesses on the buffer are aligned with the recesses in the receiver. Replace the buffer yoke from the top of the receiver (fig. 13-18).

### Replacing the Stock Group

Align the guide rails of the M60 stock with the guide rails on the receiver. Push forward until the stock is frilly seated. A distinct click will be heard when the latch engages.

### Check for Correct Assembly

To check for correct assembly, pull the cocking handle to the rear and return it to its forward position. Close the cover and pull the trigger. The bolt should go forward.

## AMMUNITION

As a member of the M60 machine gun crew, you must be able to recognize the types of ammunition available and know how to care for the different types.

Based upon the type of projectile, the ammunition authorized for the M60 machine gun is classified as follows:

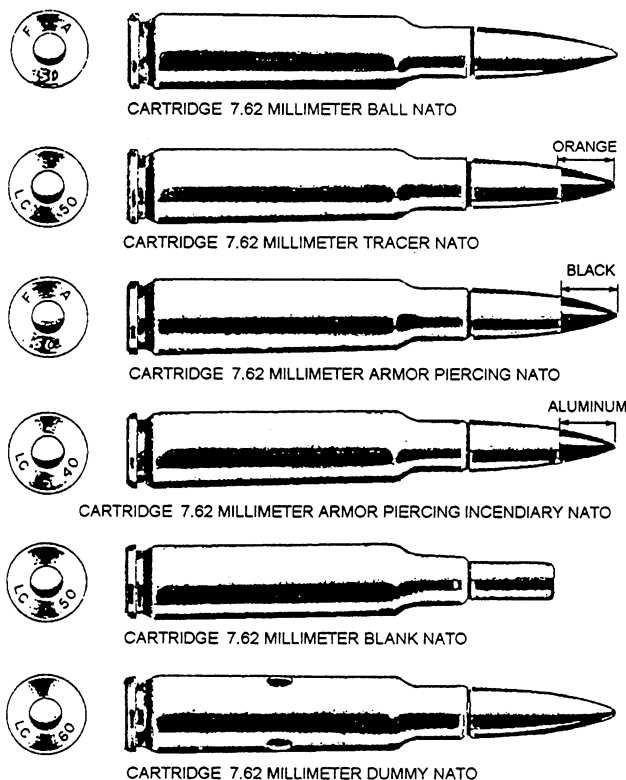


Figure 13-27.—NATO 7.62-mm cartridges for the M60 machine gun.

1. Ball cartridges are used against light material targets, such as houses and personnel, and during training.

2. Armor-piercing cartridges are used against lightly armored targets where armor-piercing effects are desired.

#### NOTE

This type of cartridge is NOT authorized for training purposes.

3. Armor-piercing incendiary cartridges are used for desired armor-piercing effects combined with fire-producing (incendiary) effects.

#### NOTE

This type of cartridge is NOT authorized for training purposes.

4. Tracer cartridges are used for observation of fire, incendiary effects, signaling, and during training.

5. Dummy cartridges are used during training.

6. Blank cartridges are used during training when simulated live fire is desired.

The different types of 7.62-mm NATO cartridges can be easily identified by the color of the projectile tips, the manufacturer's initials, and the year of manufacture stamped on the base of the cartridge case, as shown in figure 13-27.

Machine gun ammunition is generally safe to handle. However, you must protect the ammunition you are using from mud, sand, dirt, and water. Heavily corroded cartridges, or cartridges with dented cases or loose projectiles, should not be fired.

Do not expose ammunition to the direct rays of the sun. If the powder becomes hot, excessive pressure can be developed when the gun is fired.

Do not oil or grease ammunition. If it is oiled, dust and other abrasives can collect on it and damage the operating parts of the gun.

### FIRING TECHNIQUES FOR THE M60 MACHINE GUN

To become an effective machine gunner, you must apply and master the following four fundamental points of good marksmanship applicable to machine guns:

1. Obtaining an accurate initial burst of fire
2. Learning to adjust your fire
3. Developing mechanical skill in manipulating the controls
4. Developing speed

#### ACCURATE INITIAL BURST

Obtaining an accurate initial burst of fire is essential. If you can hit the enemy first, he is not going to be able to return your fire effectively. To do this, you must be able to estimate the range to the target correctly; you must correctly set your sights, and you must be able to lay the gun properly by manipulating the traversing and elevating mechanism (T & E). After the estimated range has been set on the rear sight, the gun is adjusted until the line of sight intersects the target at its center base.

#### Position and Grip

Except for the assault positions, the machine gunner should fire the M60 machine gun from the prone position, using either the biped or the tripod. In



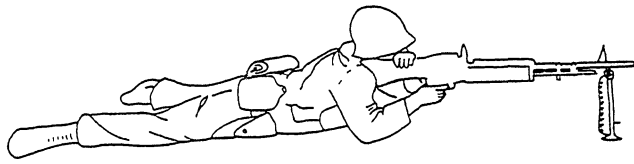


Figure 13-28.—Prone position with bipod-mounted machine gun.

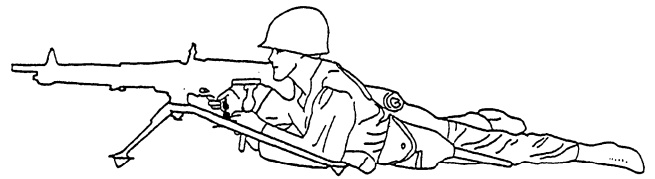


Figure 13-30.—Prone position with tripod-mounted machine gun.



Figure 13-29.—Imaginary line.

permanent defensive positions, machine gun emplacements may be dug deep enough so the gunner may stand while firing.

**BIPOD-MOUNTED GUN.**— When firing the M60 from the bipod (fig. 13-28), you must assume a prone position at the rear of the gun. Your right shoulder should be placed firmly against the butt stock group and under the raised shoulder rest. An imaginary straight line, extending through the barrel and receiver, should pass through your right shoulder and hip (fig. 13-29). Your legs should be spread comfortably apart, with your heels down (when possible). Grasp the handgrip with your right hand and place your index finger on the trigger. Place your left hand palm-down over the rear of the feed cover and apply downward pressure. Rest your cheek against your hand and the feed cover. While aiming and firing, exert firm pressure to the rear with both hands.

**TRIPOD-MOUNTED GUN.**— The firing position when firing from the tripod mount (fig. 13-30) is similar to the position used when firing from the bipod. The difference is that the hinged shoulder rest is not used,

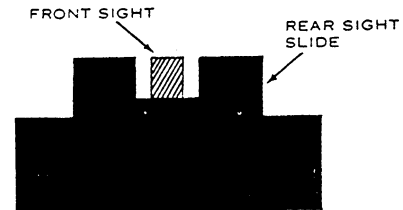


Figure 13-31.—Sight alignment.

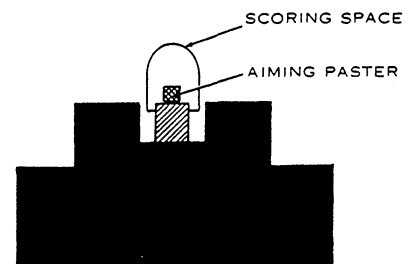


Figure 13-32.—Correct sight alignment and correct sight pictures.

and your elbows should be inside the tripod legs, but not touching the tripod. Your left hand should grasp the elevating handwheel, palm down to accomplish all manipulation. When firing and aiming, exert firm pressure to the rear with both hands as you would when firing from the bipod.

### Sighting and Aiming

After the proper range (elevation) and windage (deflection) have been set on the sights, they must be properly aligned with the target. This is done by manipulating the T & E mechanism.

**SIGHT ALIGNMENT.**— To align the sights of the M60 machine gun correctly, center the front sight blade vertically in the aperture of the rear sight slide. The top of the front sight blade should be even with the top of the rear sight slide (fig. 13-31).

**SIGHT PICTURE.**— With the sight properly aligned, obtain a 6 o'clock sight picture on the target (fig. 13-32). Always aim at the center base of the target for your initial burst of fire. When shooting at enemy personnel, aim at their beltlines.

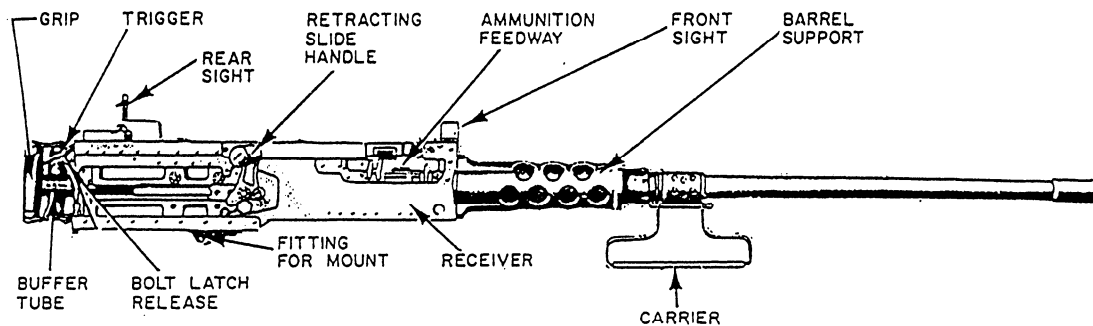


Figure 13-33.—The .50-caliber Browning machine gun (BMG), M2HB.

## ADJUSTMENT OF FIRE

Adjustment of fire is the second fundamental point of good marksmanship. Both the team leader and the gunner must observe the strike of the bullets from the initial burst. They must be able to evaluate and adjust their fire rapidly if they are not on target.

When firing the biped-mounted gun, you adjust fire by changing the position of your body. When firing the tripod-mounted gun, you adjust fire by manipulating the tripod traversing and elevating handwheel.

## ZEROING-IN

Zeroing-in the M60 is similar to zeroing-in the service rifle. Three rounds are fired at a target with a predetermined range, generally of 500 meters. The rear sight is set to 0 windage and to the corresponding range (500 meters). After the three rounds are fired, the center of the group is estimated. Next, adjust the windage knob on the rear sight, as required, bringing the strike of the bullet to the vertical center of the bull's-eye. One click clockwise or counterclockwise of the windage knob is a 1-mil adjustment. This means that at 500 meters one click will move the strike of the bullet 18 inches either right or left. Next, you must change the elevation, if required, by turning the elevation knob. A one-click adjustment clockwise or counterclockwise of the elevation knob equals a 1/4-mil change. At 500 meters this would be 4 1/2 inches.

With the correct adjustments made to the rear sight, the T & E mechanism is manipulated until the correct sight picture is again obtained. You then fire one round to confirm your sight setting. If the round misses your point of aim, you must repeat the above procedure, making the necessary adjustments until the bullet strikes where you are aiming.

After the final adjustments are made, putting the strike of the bullet at the aiming point, you must adjust the rear sight range plate. To do this, loosen the screw and move the plate until the 500-meter range mark coincides with the top left edge of the rear sight slide. Tighten the range plate screw and then record the amount of deflection for future reference.

## THE .50-CALIBER BROWNING MACHINE GUN

Browning machine guns (BMGs) are standard weapons used throughout the Navy. The .50-caliber BMG issued to naval activities is designated the M2. The weapon is available with two types of barrels. An aluminum alloy "light" barrel is used for the aircraft version of the .50-caliber BMG, M2. A "heavy" barrel (HB) is issued for ship and surface craft use. Our discussion centers around the .50-caliber BMG, M2HB (fig. 13-33).

## GENERAL DESCRIPTION

The .50-caliber BMG is a belt-fed, crew-served, recoil-operated, air-cooled weapon. It can be set for automatic and semiautomatic fire. The .50-caliber BMG does not have any positive safeties.

Ammunition is supplied to the receiver (ammunition feedway) of the gun by a disintegrating metallic link belt. The BMG is capable of alternate feed. Normally, the gun is fed from its left side; but by repositioning certain component parts, the belt may be fed from the right side.

One person can operate the .50-caliber BMG. However, two people, the gunner and assistant gunner, are normally used. The gunner actually fires the weapon.

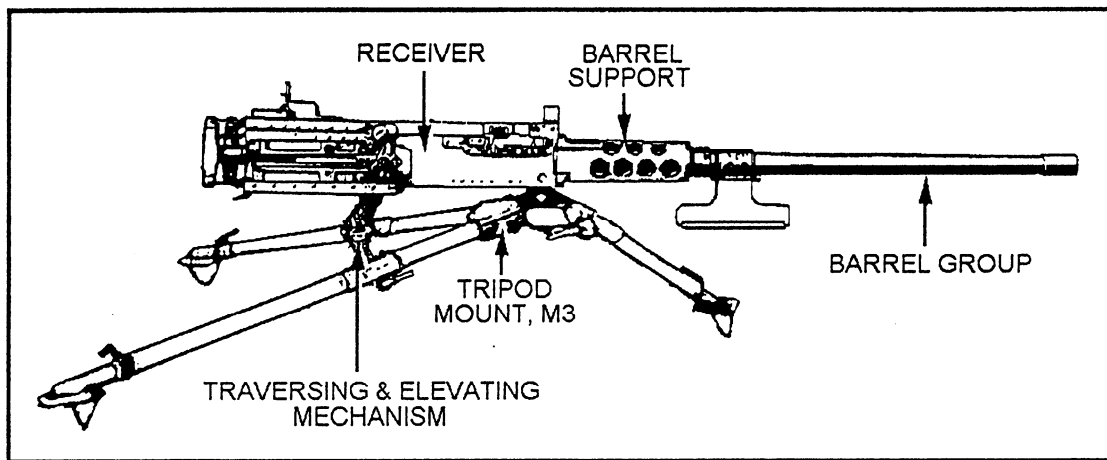


Figure 13-34.—The 30-caliber BMG on an M3 tripod mount.

The assistant gunner helps to load and reload the ammunition into the receiver. Other personnel—ammunition bearers—can be used to keep the assistant gunner supplied. Speed, skill, and teamwork are important.

The force for recoil is finished by the expanding gases of the fired cartridges. The recoil operation is controlled by various springs, cams, and levers within the gun.

Most of the barrel and receiver is exposed to the air to cool the .50 caliber BMG. Perforations (holes) in the barrel support allow air to circulate around the breech end of the barrel. A heavy barrel (HB) is used to retard, or slow down, early overheating.

The .50-caliber BMG has a leaf type of rear sight. It is graduated in both meters and mils for ranges from 100 to 2600 meters and from 0 to 62 mils. A windage knob permits deflection changes of 5 mils right or left of the center. The front sight is a semifixed blade type with a cover.

Because of its size and weight, the .50-caliber BMG usually needs some type of mounting support. Figure 13-34 shows the M3 tripod mount arrangement. Other devices or stands may also be used. The primary reason for mounting the weapon is to increase its firing accuracy.

The main characteristics of the .50-caliber BMG are listed below.

Weight of receiver group . . 60 pounds

Weight of barrel . . . . . 24 pounds  
(approximately)

Weight of tripod mount  
M3 (w/traversing and  
elevating mechanism  
and pintle w/bolt) . . . . . 44 pounds

Total weight of gun,  
complete, on tripod  
mount, M3 . . . . . 128 pounds  
(approximately)

Maximum range  
(M2 ball) . . . . . 6800 meters  
(approximately)

Maximum effective  
range . . . . . 1830 meters

Rates of fire:

Sustained . . . . . 40 rounds or less  
per minute

Rapid . . . . . 40 rounds or more  
per minute

Cyclic rate of fire . . . . . 450 to 550 rounds  
per minute

Muzzle velocity  
(M2 ball) . . . . . 3,050 feet/second  
(2,080 mph)

Length of gun, overall . . . 65 inches  
(approximately)

Length of barrel . . . . . 45 inches

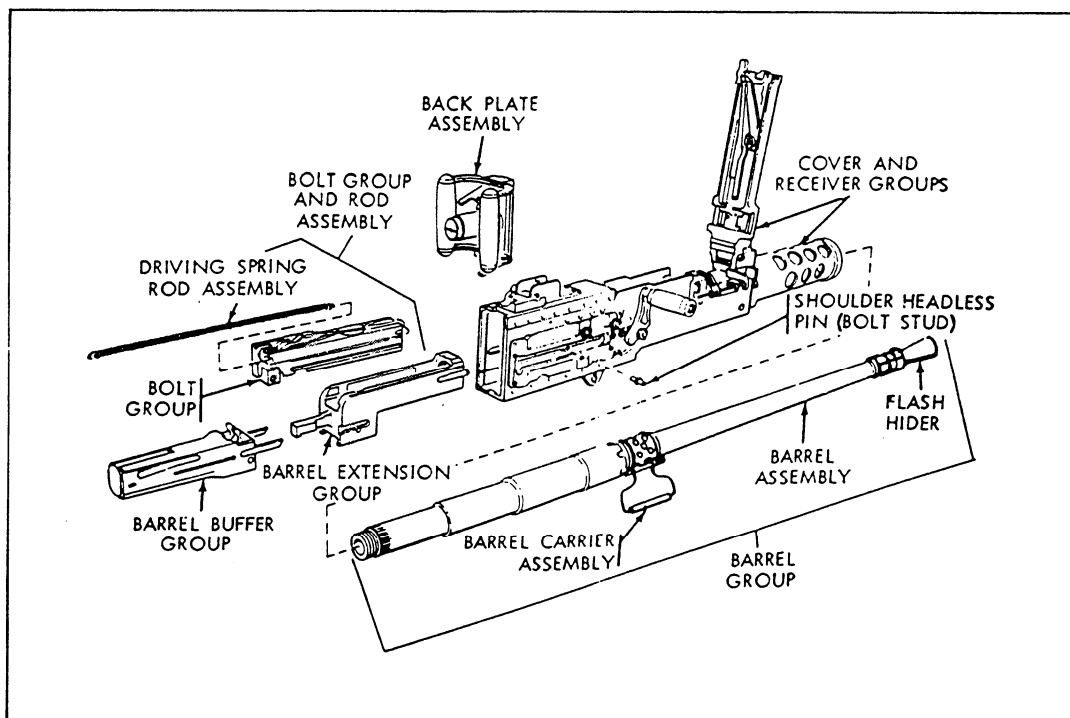


Figure 3-35.—Major component groups and assemblies.

## GENERAL DISASSEMBLY

Figure 13-35 shows the major component groups and assemblies of the .50-caliber BMG. For routine cleaning and maintenance, you need to know the general disassembly procedures. Detailed disassembly procedures remove all parts from each group. These steps are explained in the FM23-65 of the U.S. Army. Be sure to consult the field manual if you must do a detailed disassembly.

Before starting general disassembly procedures, you must clear the weapon. This includes ensuring the gun is unloaded, cocked, and the bolt is forward. The primary steps involve removal of the following parts:

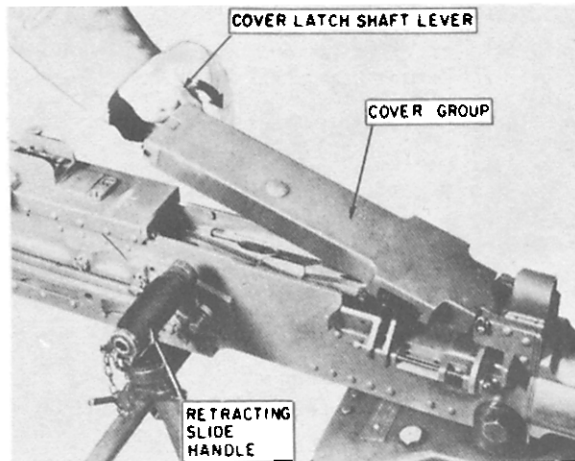
1. Barrel group
2. Backplate assembly
3. Driving spring rod assembly
4. Bolt stud
5. Bolt group
6. Buffer body and barrel extension groups
7. Buffer assembly

## Remove Barrel Group

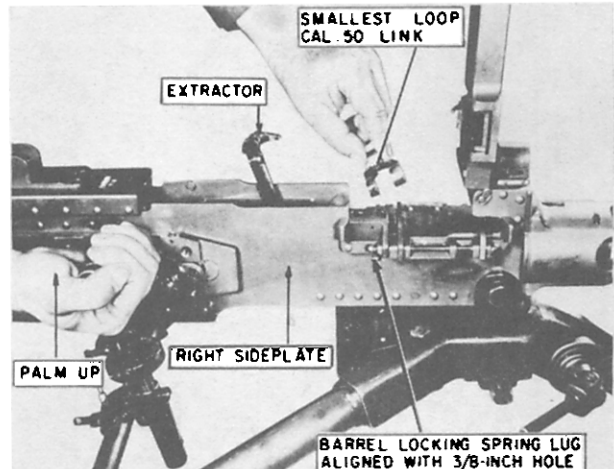
The actions required to remove the barrel group are shown in figure 13-36. Turn the cover latch lever forward and raise the cover group (view A). Pull the retracting slide (bolt) handle to the rear slowly (view B). That moves the recoiling parts of the gun to the rear.

Pull rearward until the lug on the barrel locking spring aligns with a 3/8-inch hole. The hole is in the right sideplate of the receiver, just below the feedway exit. The barrel can be turned only when the lug is aligned with the 3/8-inch hole. Place the smallest loop of a .50-caliber belt link (or suitable spacer) between the trunnion block and the barrel extension. This holds the barrel locking spring lug in alignment with the 3/8-inch hole in the right sideplate (view C).

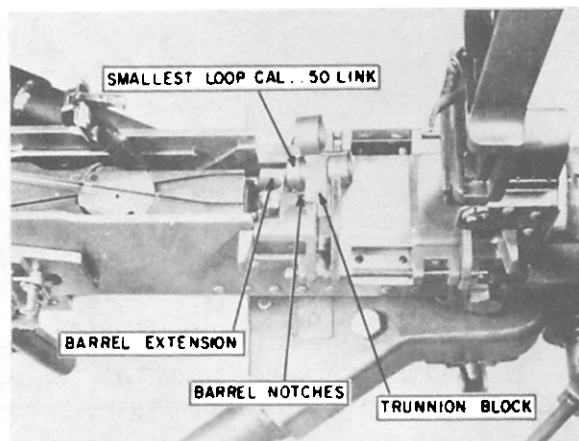
Now, unscrew the barrel from the receiver (view D). Be careful not to damage the threads or barrel-locking notches when setting the barrel down. Complete this phase of disassembly by pulling back slightly on the retracting slide handle. Then remove the .50-caliber link (or spacer) from the receiver. Do not allow the bolt to slam forward with the barrel removed; this causes damage. Let the retracting slide handle (and bolt) ease forward carefully.



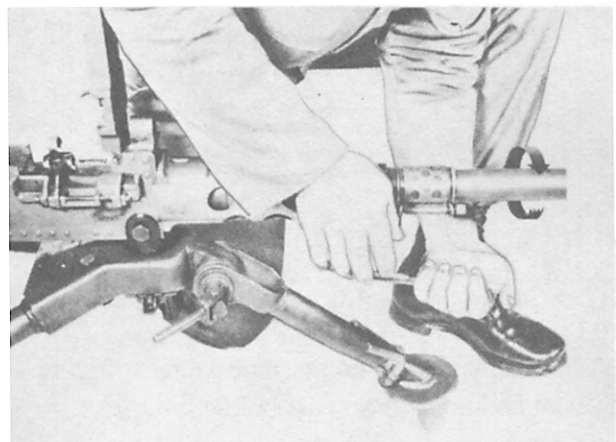
A-RAISING THE COVER GROUP.



B-ALIGNING THE LUG ON THE BARREL LOCKING SPRING WITH THE 3/8-INCH HOLE IN THE RECEIVER'S RIGHT SIDEPLATE.



C-USING THE SMALLEST LOOP OF A .50-CAL LINK TO KEEP THE BARREL LOCKING SPRING LUG ALIGNED WITH THE 3/8-INCH HOLE.



D-UNSCREWING THE BARREL GROUP FROM THE RECEIVER.

Figure 13-36.—Removing the barrel group.

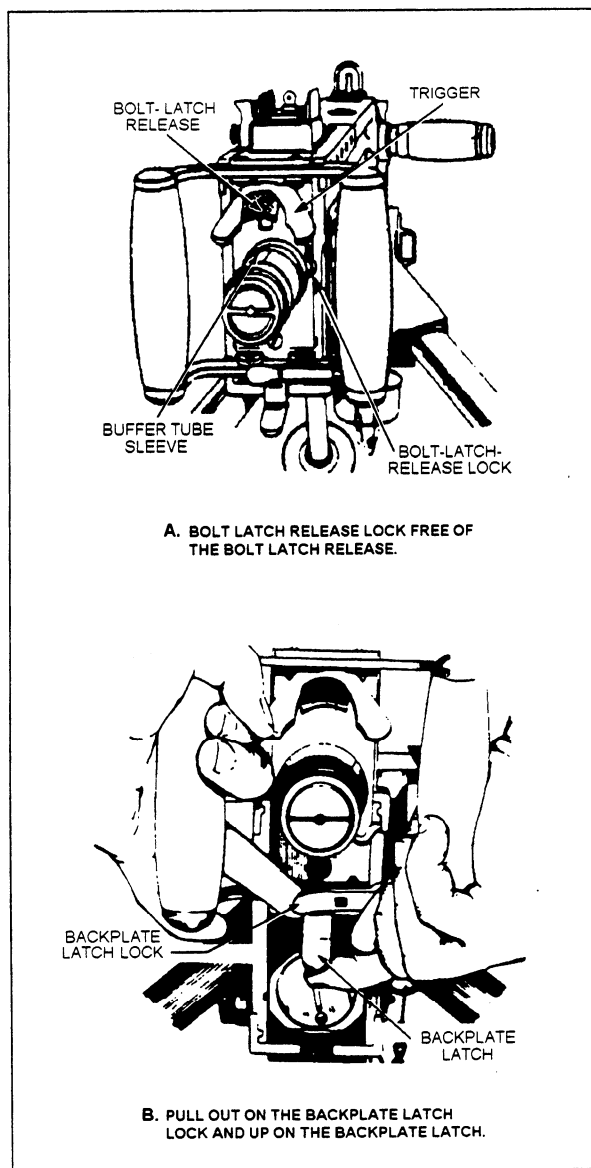


Figure 13-37.—Removing the backplate assembly.

### Remove Backplate Assembly

To remove the backplate assembly, refer to figure 13-37. Two conditions must exist before the backplane assembly can be removed. First, the bolt latch release must be up and free of the bolt latch release lock. If it is not, push down on the bolt latch release (fig. 13-37, view A). Turn the buffer tube sleeve to the right. Keep turning until the bolt latch release lock is free of the bolt latch release.

The second condition is that the bolt must be forward. If it is not, depress the bolt latch release. At the same time, use the retracting slide handle to ease the bolt

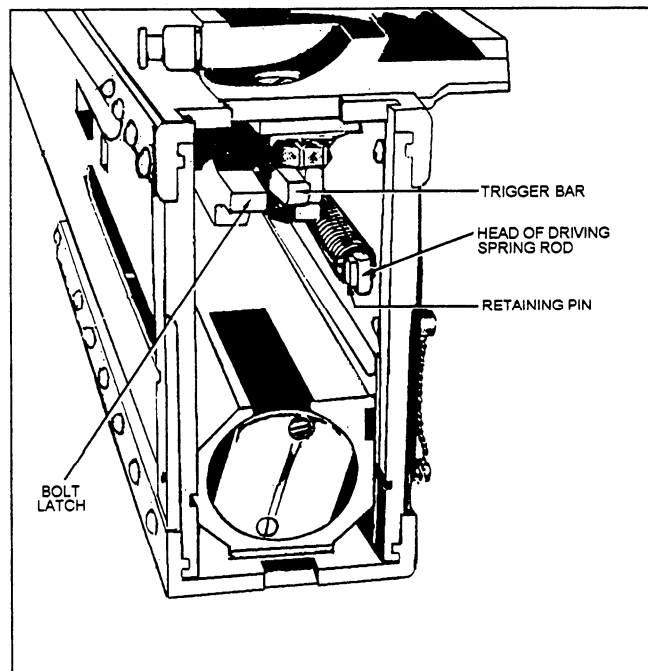


Figure 13-38.—Removing the driving spring rod assembly.

forward. When the bolt latch release is up and the bolt is forward, the backplate assembly can be removed. Located below the buffer tube sleeve are the backplate latch and latch lock. Pull out on the latch lock and up on the latch, as shown in figure 13-37, view B. Remove the backplate by lifting it straight up.

### Remove Driving Spring Rod Assembly

The driving spring rod assembly consists of its inner and outer springs and a rod. The assembly is located next to the right sideplate inside the receiver (fig. 13-38).

To remove the assembly, push in on the head of the driving spring rod. Push it to the left and remove the driving spring rod retaining pin from its seat in the right sideplate. Pull the complete assembly to the rear and out of the receiver.

Use caution when removing the driving spring rod assembly. You should feel a slight pressure on the springs when the bolt is forward. Never attempt to cock the gun while the backplate assembly is off and the driving spring rod assembly is installed. Cocking the gun compresses the spring group. If the retaining pin slips from its seat, the rod will come flying out! Anyone standing behind the gun could be injured.

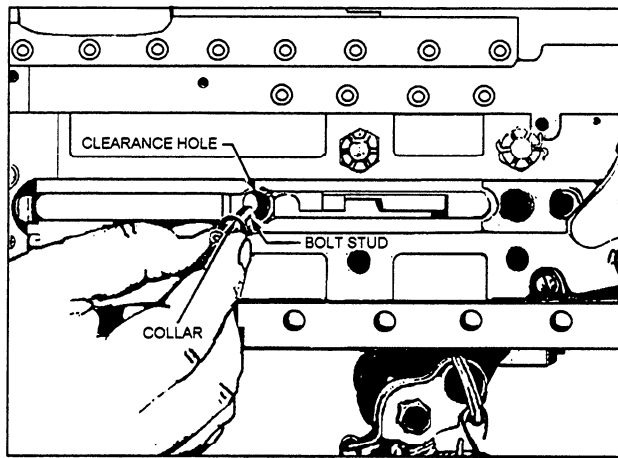


Figure 13-39.—Removing the bolt stud.

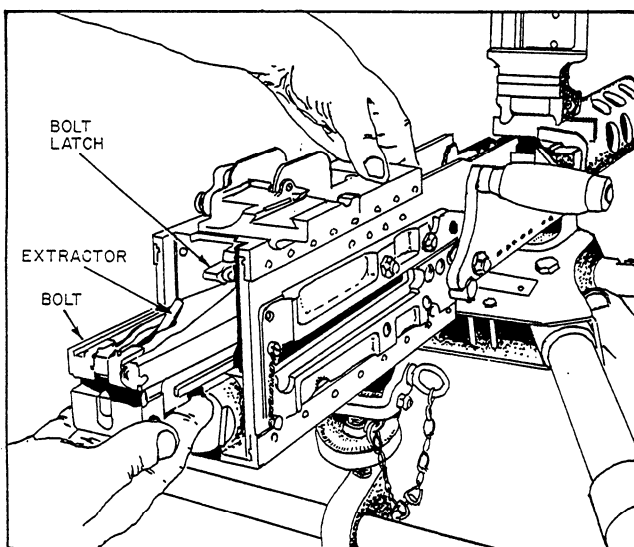


Figure 13-40.—Removing the bolt group.

## Remove Bolt Stud

To remove the bolt stud (a shoulder headless pin), grasp the retracting slide handle. Give the handle a quick jerk, moving it about halfway to the rear. That action frees the bolt group from the barrel extension group. Move the bolt rearward until the shoulder on the bolt stud aligns with a clearance hole. The hole is in the bolt slot on the right sideplate (fig. 13-39). Removing the bolt stud frees the bolt group.

If the bolt is accidentally moved all the way to the rear, it will lock in place. If that occurs, raise the bolt latch. (See fig. 13-40.) Push the bolt forward to align

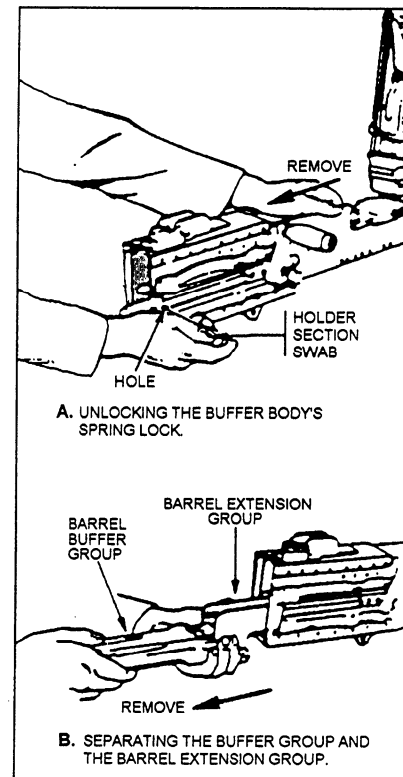


Figure 13-41.—Removing the buffer body and barrel extension groups.

the bolt stud with the clearance hole. Then proceed as before.

## Remove Bolt Group

After freeing the bolt, slide it from the rear of the receiver (fig. 13-40). Place the bolt down on its right side with the extractor arm up. That prevents the extractor from falling out of the bolt.

## Remove Buffer Body and Barrel Extension Groups

These two groups are removed as a unit. To remove them, insert a pointed tool through a hole in the lower rear corner of the right sideplate (fig. 13-41, view A). Pushing in on the tool releases the spring lock of the buffer body. At the same time, pull and remove the two groups from the rear of the receiver.

Now separate the buffer body group from the barrel extension group. Hold the unit as shown in view B of the figure. Push forward on the tips of the accelerator and pull the two groups apart.

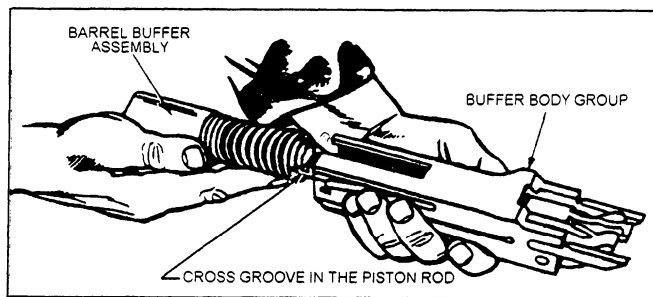


Figure 13-42.—Removing the buffer assembly.

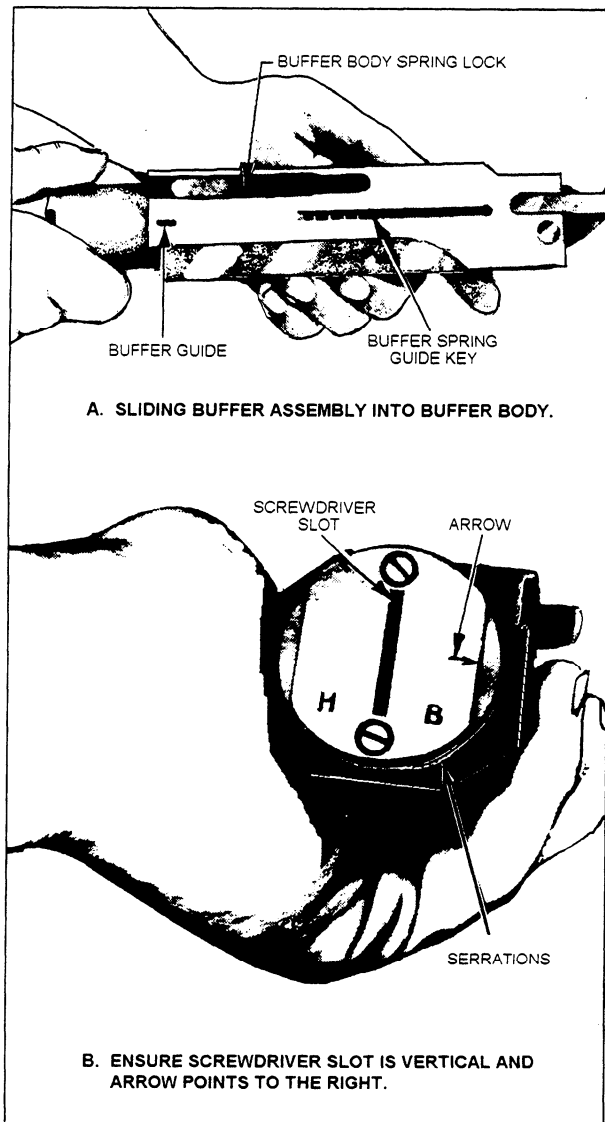


Figure 13-43.—Replacing the buffer assembly.

### Remove Buffer Assembly

To remove the buffer assembly, hold the buffer body, as shown in figure 13-42. Pull the buffer assembly to the rear. That completes the general disassembly of the .50-caliber BMG. Limited cleaning, maintenance, and major part/group replacement can be done now.

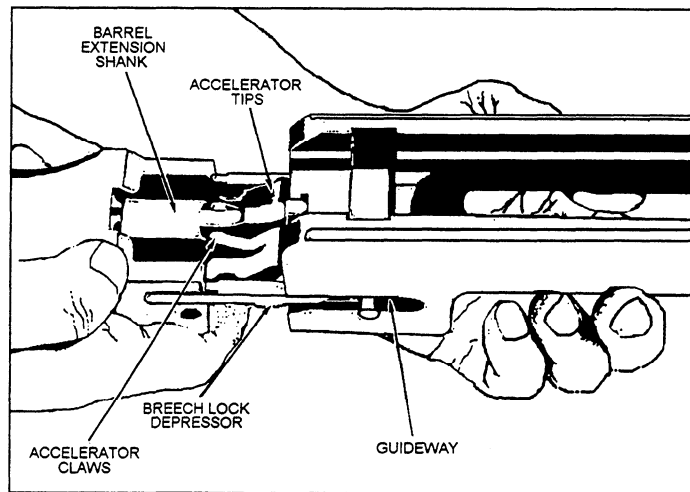


Figure 13-44.—Joining the buffer body and barrel extension groups.

### GENERAL ASSEMBLY

To reassemble the .50-caliber BMG, replace the major component groups in reverse order. You should follow certain procedures to do the job correctly. These procedures are explained in the following paragraphs.

#### Replace Buffer Assembly

Slide the buffer assembly into the buffer body group, as shown in figure 13-43, view A. Ensure the spring guide key fits into the slot in the buffer body.

Turn the buffer tube until the screwdriver slot is vertical (view B). The arrow on the tube must point to the right. The stud on the tube lock will now engage the serration in the buffer tube. That keeps the tube from turning. Push the buffer assembly all the way forward.

#### Replace Buffer Body and Barrel Extension Groups

Figure 13-44 shows how these two groups are joined together. Align the breech lock depressors with their guideways in the barrel extension. Also, engage the barrel extension shank to the accelerator claws, as shown.

Push the two groups together. Press down on the accelerator tips to ensure the two groups are locked together. Place them into the rear of the receiver. Push them forward until the buffer body spring lock (fig. 13-43, view A) snaps in place. Properly locked in place, the buffer tube should protrude about 1 1/8 inches from the rear of the buffer body group.

#### Replace Bolt Group

Figure 13-45 shows how the bolt group is replaced into the receiver. The top of the cocking lever must be



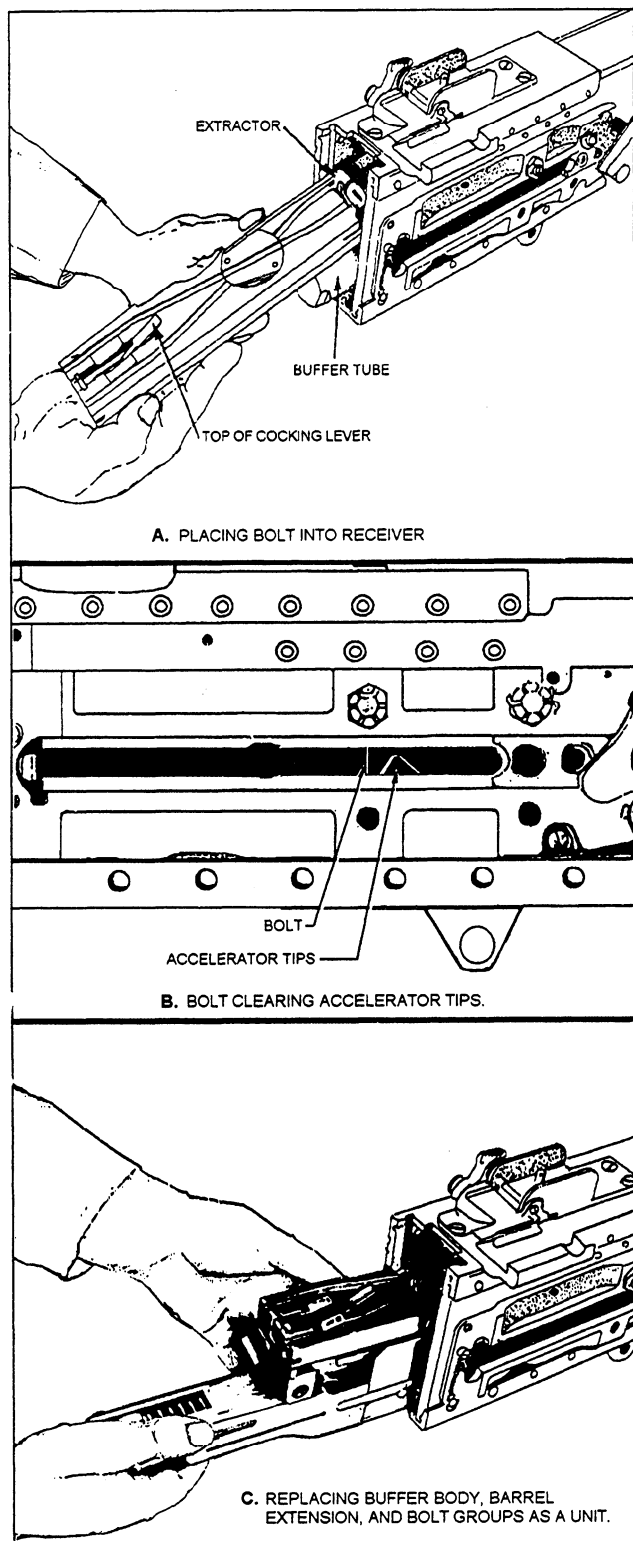


Figure 13-45.—Replacing the bolt group.

forward and the extractor must be down (flat), as shown in view A.

Push the bolt forward, maneuvering it so the front end clears the accelerator tips, as shown in view B. That condition can be seen through the sideplate of the receiver. Continue pushing the bolt forward until the bolt latch engages the notches in the top of the bolt.

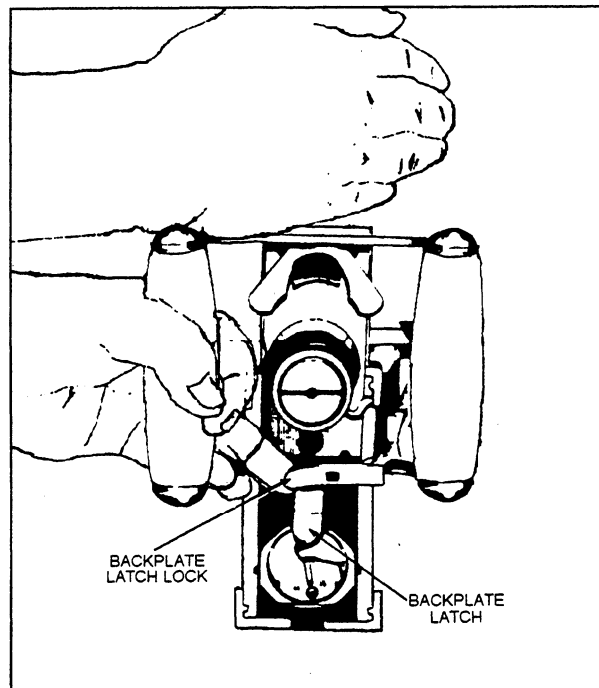


Figure 13-46.—Replacing the backplate assembly.

View C of the figure shows an optional procedure. The buffer body, barrel extension, and bolt groups can be assembled outside the receiver. Then, all three groups are inserted as a single unit.

### Replace Bolt Stud

The actions required to replace the bolt stud are almost the same as those required to remove it. (See fig. 13-39.) Align the stud hole in the bolt with the clearance hole in the right sideplate. Ensure the shoulder of the stud fits inside the sideplate.

### Replace Driving Spring Group

To replace the driving spring group, press up on the bolt latch. Move the bolt all the way forward by pushing on the bolt stud only. Place the end of the driving spring rod in its hole in the back of the bolt. Then push forward on the driving spring group and the buffer tube. Press in and push the head of the rod to the right. Insert the retaining pin in its seat in the right sideplate. (See fig. 13-38.)

### Replace Backplate Assembly

To replace the backplate, hold its latch down and the trigger up. Position the backplate guides in their guideways. Hold the latch lock out and slide the backplate down until the latch snaps into place, as shown in figure 13-46. Release the latch lock and tug up on the backplate assembly to ensure it is firmly seated.

## Replace Barrel Group

To replace the barrel group, pull the retracting slide handle to the rear. Do so until the lug on the barrel locking spring is visible through the 3/8-inch hole in the right sideplate. (See fig. 13-36,) Again, insert the smallest loop of a .50-caliber link, or suitable spacer, between the trunnion block and barrel extension.

Screw the barrel all the way into the barrel extension. Then, and this is important, unscrew the barrel two notches. Remove the link and close the cover group. That completes the general assembly of the .50-caliber BMG.

## OPERATING THE .50-CALIBER BMG

The safest and best way to operate the .50-caliber BMG is to follow established procedures. In doing so, you prevent damage to the gun and injury to yourself and others. The basic operating procedures involve the following steps:

1. Loading
2. Half-loading
3. Full-loading
4. Unloading

### Semiautomatic Operation

If single-shot firing is desired, the gun must be set for semiautomatic operation. To do so, you must ensure the bolt latch release is in the up position (or not locked down). (The bolt latch release can be seen in view A of fig. 13-37.)

When the bolt latch release is up, the bolt latch assembly is depressed. In this position, the latch assembly can engage notches on top of the bolt when it (the bolt) is to the rear. Thus, when the bolt recoils after around is fired, it remains locked to the rear.

Depressing the bolt latch release raises the latch assembly. The assembly disengages from the notches on top of the bolt. That allows the bolt to be driven forward into the battery.

To fire the .50-caliber BMG when set for semiautomatic, (1) depress the bolt latch release and (2) depress the trigger. These two actions must be done for each round fired.

## Automatic Operation

If automatic firing is desired, the gun must be set for automatic operation. To do so, you must ensure the bolt latch release is depressed and locked down. That is done by turning the buffer tube sleeve. The bolt latch release lock is rotated to engage the bolt latch release, locking it down. (See view A of fig. 13-36 again.)

When the bolt latch release is locked down, the bolt latch assembly remains in its up position. Thus, when the bolt recoils, it is automatically free to return forward into the battery.

To fire the .50-caliber BMG in automatic, (1) lock the bolt latch release down and (2) depress the trigger. Short bursts are generally recommended, rather than sustained firings.

### Loading Operation

The .50-caliber BMG is loaded manually. This involves placing an ammunition belt into the receiver of the gun. Ammunition for the .50-caliber BMG comes prebelted and is shipped in a standard .50-caliber ammunition box.

To load the gun, open and remove the lid on the ammunition box. Then open and raise the cover group on the gun (fig. 13-47). Insert the double-loop end of the ammunition belt into the feedway of the receiver. Ensure the first cartridge is held by the belt-holding pawl. Close the cover group on the gun and make sure it is latched securely.

If two personnel are operating the .50-caliber BMG, the assistant gunner loads the ammunition belt. The gunner performs the next two operations-half-loading and full-loading.

### Half-Loading Operation

Half-loading is a term associated with the .50-caliber BMG. It can be compared to feeding. Feeding is the first of eight steps in a cycle of operation. It places a round in the receiver just to the rear of the receiver. Do not confuse loading the .50-caliber BMG (described earlier) with half-loading. The two operations are different.

Half-loading the gun is done after the ammunition belt is installed and the cover group closed. To half-load the gun, the gunner grasps the retracting slide handle, pulls it smartly to the rear, and releases it. At this point, two things can occur. What happens depends on whether the gun is set for automatic or semiautomatic fire.

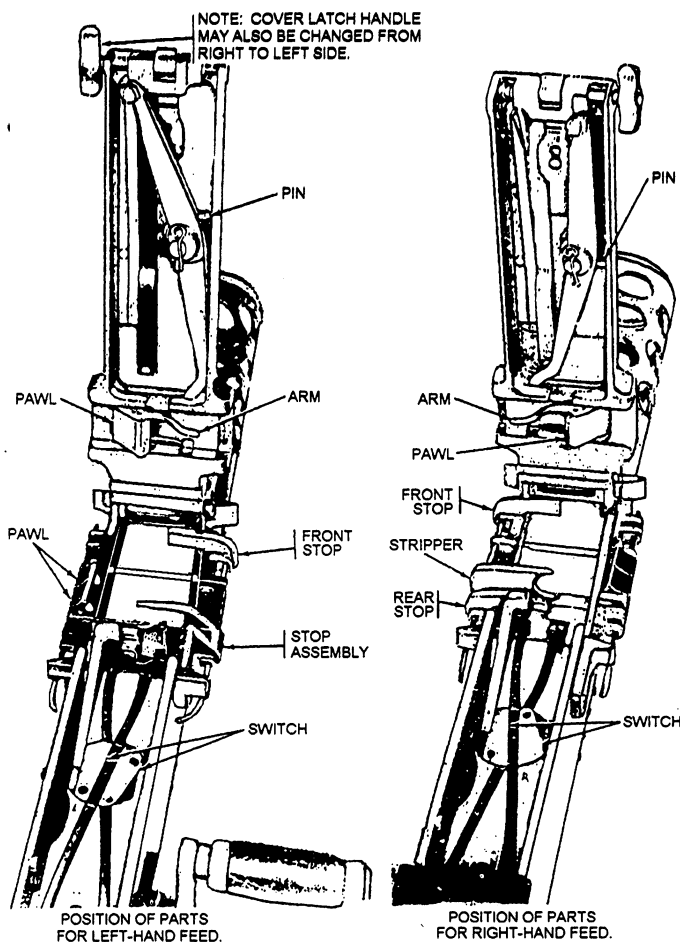


Figure 13-47.—Feeding mechanism parts of the receiver setup for left-hand and right-hand feeding.

When the gun is set for automatic fire, the bolt latch release lock holds the bolt latch release down. When the retracting slide handle is released, it and the bolt will go forward. They are driven forward under pressure from the driving spring group. The gun is now half-loaded (in automatic).

When the gun is set for semiautomatic fire, the bolt latch release is up. When the retracting slide handle is released, it and the bolt will remain to the rear. To complete the half-load operation, the gunner must do two things. First, the retracting slide handle must be pushed all the way forward. Second, the bolt latch release must be depressed. That unlocks the bolt and it drives forward. The gun is now half-loaded (in semiautomatic).

Can the .50-caliber BMG be fired now that it is half-loaded? The answer is no. Half-loading only places a round into the receiver behind the barrel. The round must be chambered before it can be fired.

## Full-Loading Operation

Full-loading a .50-caliber BMG can be compared to cambering. Cambering was the second of eight steps in a cycle of operation. It places a new round in the chamber of the gun.

To load the gun fully, you must repeat the half-loading sequence. Pull the retracting slide handle to the rear and release it. The weapon is now ready to fire.

## Unloading Operation

To unload a .50-caliber BMG, unlock the bolt release latch (if applicable) and open the cover group. Lift the ammunition belt out of the feedway. Pull the retracting slide handle to the rear and lock the bolt. Look and/or feel to make sure no ammunition is in the gun.

If the weapon is clear, lower the extractor. Release the bolt and ease the retracting slide handle forward. Then lower and secure the cover group. To complete unloading operations, depress the trigger to uncock the firing mechanism.

## Cycle of Operation

The first two steps of the eight-step cycle of operation have already been discussed. Initial feeding and cambering are accomplished during the manual half- and full-loading operations. After the first round is fired, feeding and cambering are done by the action of the gun.

The remaining steps in the cycle of operation of a .50-caliber BMG are summarized below.

1. Locking—The bolt is locked to the barrel and barrel extension.
2. Firing—The firing pin is released and driven forward to strike the primer of the cartridge.
3. Unlocking—The bolt unlocks from the barrel and barrel extension.
4. Extracting—The empty cartridge case is pulled from the chamber.
5. Ejecting—the empty cartridge case is ejected from the receiver.
6. Cocking—The firing pin is withdrawn into its cocked position.

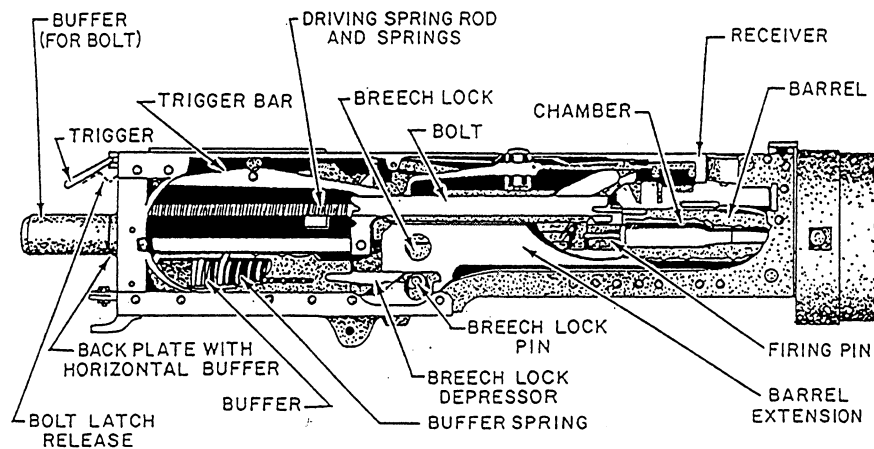


Figure 13-48.—The .50-caliber BMG receiver; cutaway view.

You can follow most of the operating cycle of the gun by referring to figure 13-48. Assume the chamber is loaded, the gun is cocked, and the bolt latch is released. When the trigger is depressed, the trigger bar pivots and releases the cocked firing mechanism. The spring-loaded firing pin strikes the primer and the cartridge fires. Pressure from the expanding gases causes the recoiling parts of the gun to start moving rearward.

During the first  $\frac{3}{4}$  inch of rearward travel, the recoiling parts remain locked together. However, the breech lock depressors are acting on the breech lock pin. That action forces the breech lock down and out of the bolt. As a result, at the end of the first  $\frac{3}{4}$  inch of recoil, the bolt is unlocked. It is free to continue recoiling independent of the barrel and barrel extension.

The barrel extension hits the accelerator. It, in turn, hits the bolt and accelerates it (the bolt) to the rear. The barrel and barrel extension recoil another  $\frac{3}{8}$  inch ( $1\frac{1}{8}$ -inch-total travel). They are stopped by the buffer assembly.

Meanwhile, the bolt recoils an additional  $6\frac{3}{8}$  inches to the rear ( $7\frac{1}{8}$ -inch-total travel). During this movement, the driving spring group is compressed and the bolt is stopped by the bolt buffer mechanism. The fired cartridge is extracted and the firing mechanism is cocked.

Counter recoil forces the bolt forward and the empty cartridge case is ejected. The bolt locks to the barrel extension and both move forward into the battery. Feeding and cambering have taken place and the gun is ready to fire. The cycle begins when the firing pin is released to set off the next cartridge.

## Headspace and Timing Adjustments

By now, you should realize that the .50-caliber BMG is a complex working machine. The care and maintenance given this gun are critical for safe and continued operation. In addition to normal lubrication and cleaning practices, checking and adjusting the headspace and timing of the weapon are mandatory.

**HEADSPACE ADJUSTMENT.**—Headspace is the distance between the face of the bolt and the base of a seated cartridge case. The distance is correct when the following conditions are met:

1. The recoiling groups are fully forward.
2. There is no independent rearward movement between the bolt, barrel, and barrel extension.

Improper headspace adjustment can cause a lot of problems. It causes the gun to operate improperly and, frequently, causes damage to the weapon or injury to personnel.

Headspace must be checked and set before the gun is fired. Other instances when it must be checked include the following:

1. When the gun is assembled
2. When the barrel or any major group or assembly within the receiver is replaced
3. When there is doubt that correct headspace is set

A special tool is used to check and set the headspace distance. It is called the "headspace gauge" and is part of the headspace and timing gauge set (fig. 13-49). The tool should be kept with the gun at all times. For now, we are only interested in the GO-NO-GO headspace

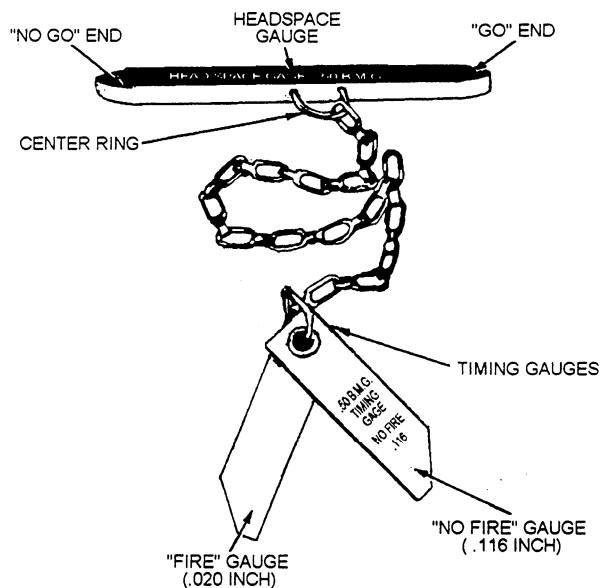


Figure 13-49.—Headspace and timing gauge set.

gauge. The following steps explain how to check and set the headspace adjustment:

1. With the cover group closed, cock the gun. Do so by pulling the retracting slide handle all the way to the rear.
2. Depress the bolt latch release and slowly ease the restricting slide handle and bolt all the way forward.
3. Raise the cover group. Pull back on the retracting slide handle slightly. Move the bolt not more than  $1/16$  inch to the rear. That prevents the driving spring group and the weight of the parts from giving a false reading. Raise the extractor.
4. Insert the GO end of the headspace gauge into the T-slot. The T-slot is between the face of the bolt and the rear of the barrel, as shown in figure 13-48. The GO end of the gauge should enter the T-slot freely up to the center ring of the gauge. Remove the gauge and try to insert the NO-GO end into the T-slot. If the NO-GO end does not enter the slot, headspace distance is correct.

**Headspace Too Tight.**— If the headspace is too tight, the GO end of the gauge cannot enter the T-slot freely. To correct this situation, take the following steps:

1. Pull back on the retracting slide handle. Do so until the lug on the barrel locking spring is visible through the  $3/8$ -inch hole in the right sideplate. (See fig. 13-36.)
2. Unscrew the barrel one notch (click).
3. Ease the retracting slide handle and bolt fully forward.

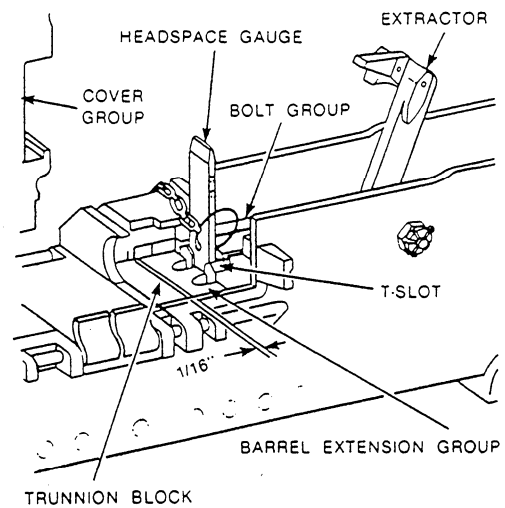


Figure 13-50.—Checking the headspace with the GO end of the headspace gauge.

4. Retract the bolt slightly, not exceeding  $1/16$  inch (fig. 13-50). Recheck the headspace adjustment as before.

If necessary, repeat this procedure to obtain the proper adjustment. Be sure to unscrew the barrel only one notch (click) each time. If the adjustment cannot be made within one to five (maximum) notches (clicks), notify the maintenance supervisor.

**Headspace Too Loose.**— If the headspace is too loose, the NO-GO end of the gauge will enter the T-slot freely. The adjustment procedures for this situation are the same as those just described. However, screw the barrel in one notch (click) at a time for each adjustment attempt.

**TIMING ADJUSTMENT.**— Timing of the weapon is as critical as headspace adjustment. Timing ensures that firing takes place when the recoiling parts are between .020 and .116 inch out of the battery. That prevents contact between the front end of the barrel extension and the trunnion block. Timing is correct when the following conditions are met:

1. The recoiling parts are locked together.
2. Firing takes place just before the recoiling parts are in the battery (fully forward).
3. The gun fires on the FIRE gauge and does not fire on the NO-FIRE gauge.

The timing of the gun is checked with the FIRE (.020 inch) and NO-FIRE (.116 inch) gauges, as shown in figure 13-49. Timing must be checked and/or set (1) each time headspace is adjusted and (2) whenever the

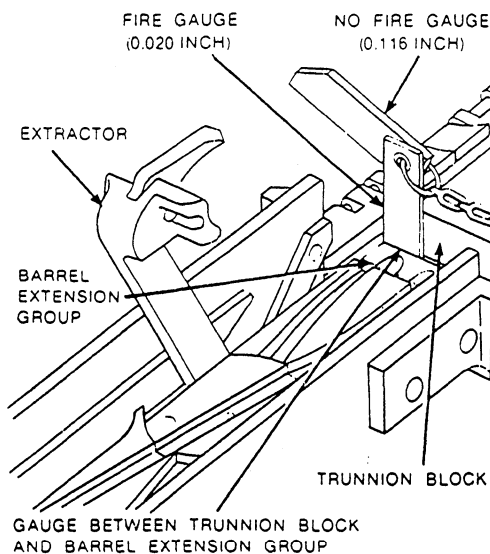


Figure 13-51.—Checking the timing with the fire gauge installed.

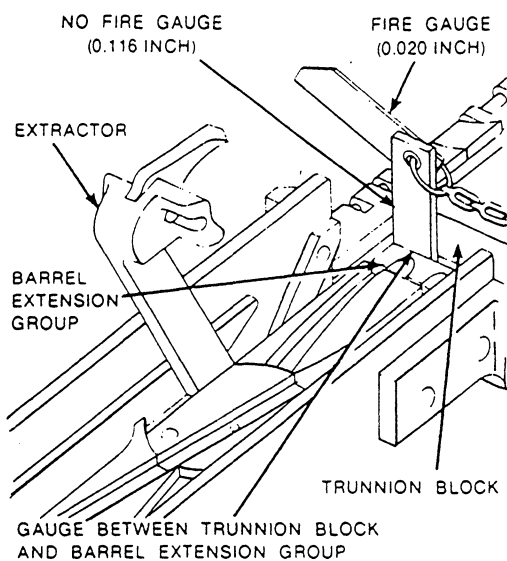


Figure 13-52.—Checking the timing with the NO-FIRE gauge installed.

timing is questionable. The following steps explain how to check and set the timing adjustment:

1. Ensure the headspace adjustment is correct. If not, correct it before checking the timing.
2. Ensure the firing pin is cocked and the recoiling parts are forward in the battery position.
3. Raise the extractor.
4. Retract the recoiling parts enough to insert the FIRE (.010 inch) gauge. Place it between the barrel extension and trunnion block (fig. 13-51).

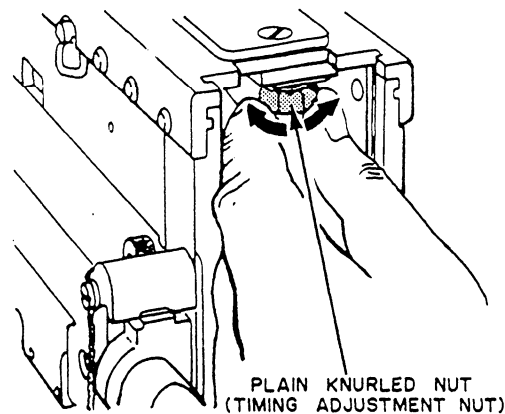


Figure 13-53.—Turning the trigger bar adjusting nut: Turn to the right to correct for late timing; turn to the left to correct for early timing.

5. Allow the barrel extension to close on the gauge slowly.

6. Depress the trigger. The firing pin should release. Releasing indicates that the timing is correct (or not late).

7. Retract the recoiling parts enough to remove the FIRE gauge. Cock the gun and allow the recoiling parts to go forward into the battery.

8. Retract the recoiling parts enough to insert the NO-FIRE (.116 inch) gauge. Place it in the same location, between the barrel extension and the trunnion block (fig. 13-52).

9. Depress the trigger. The firing pin should not release. Its failure to release indicates that the timing is correct (or not early).

**Late Timing Adjustment.**— If the timing of the gun is late, the firing pin will not release with the FIRE gauge installed. (Refer to Step 6 above.) To correct this situation, perform the following steps:

1. Retract the recoiling parts enough to remove the FIRE gauge. Allow them to return forward into the battery.
2. Remove the backplate assembly. (See fig. 13-34.)
3. Locate and turn the trigger bar adjusting nut one notch to the right (fig. 13-53).
4. Reinstall the backplate assembly. (See fig. 13-46.)
5. Retract the recoiling parts enough to insert the FIRE gauge again. Allow the barrel extension to close on the gauge slowly.

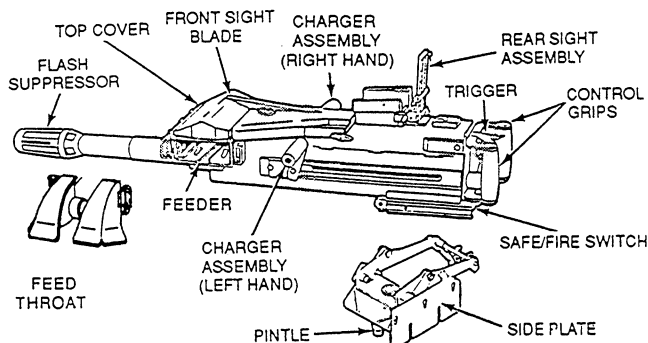


Figure 13-54.—MK 19 MOD 3 40-mm machine gun.

6. Depress the trigger. The firing pin should release.

If necessary, repeat the procedure until the firing pin releases with the FIRE gauge installed.

**Early Timing Adjustment.**— If the timing of the gun is early, the firing pin will release with the NO-FIRE gauge installed. The adjustment procedures for this situation are the same as those described above. However, turn the trigger bar adjusting nut one notch to the left. Reinstall the NO-FIRE gauge and depress the trigger. The firing pin should not release. Repeat the procedure as necessary.

The importance of obtaining the correct headspace and timing adjustments on the .50-caliber BMG cannot be stressed enough. The U.S. Army field Manual (FM23-65) and appropriate MRCs for the weapon describe the required procedures in detail. Consult those references to make these adjustments. Do them carefully and deliberately.

### MK 19 MOD 3 40-MM MACHINE GUN

This section is intended to finish you with basic information about the MK 19 machine gun. The MK 19 will become part of the TOA in the near future. Information on safety, operation, and maintenance is available in TM 9-1010-230-10.

The MK 19 MOD 3 (fig. 13-54) is a machine gun that fires a 40-mm grenade with antipersonnel fragmentation and light anti-armor capability. It fires 40-mm grenades at the rate of 325 to 375 rounds per minute. The MK 19 MOD 3 is an air-cooled, belt-fed, blowback-operated, fully automatic weapon. Because it fires from an open bolt, the MK 19 MOD 3 does not “cook off.”

- Lower gun cradle onto mount. Insert pintle into center hole.
- Flip down pintle lock on mount.
- Disengage stow pin.
- Attach T & E to gun cradle.

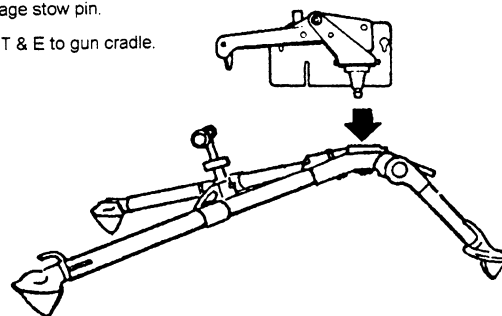


Figure 13-55.—MK 64 mount/cradle and M3 tripod.

### DATA

Weight . . . . .	75.6 pounds;crew transportable
Length . . . . .	43.1 inches
Width . . . . .	13.4inches
Height . . . . .	8.8 inches
Rate of Fire (Cyclic) . . . .	325 to 375 rounds per minute
<b>Range:</b>	
Effective Point Target . . .	1500 meters
Effective Area Targets . . .	2212 meters

### MK 64 MOUNT

Weight . . . . .	21 pounds
Length . . . . .	17.5 inches
Height . . . . .	9.5 inches

### MK 64 MOUNT and M3 TRIPOD

The MK 64 mount/cradle attaches to the M3 tripod (fig. 13-55) and a variety of vehicle mounts. The MK 64 holds the gun and allows it to traverse and elevate on the vehicle or tripod. It also features a travel lock that holds the weapon in travel position during vehicle operation.

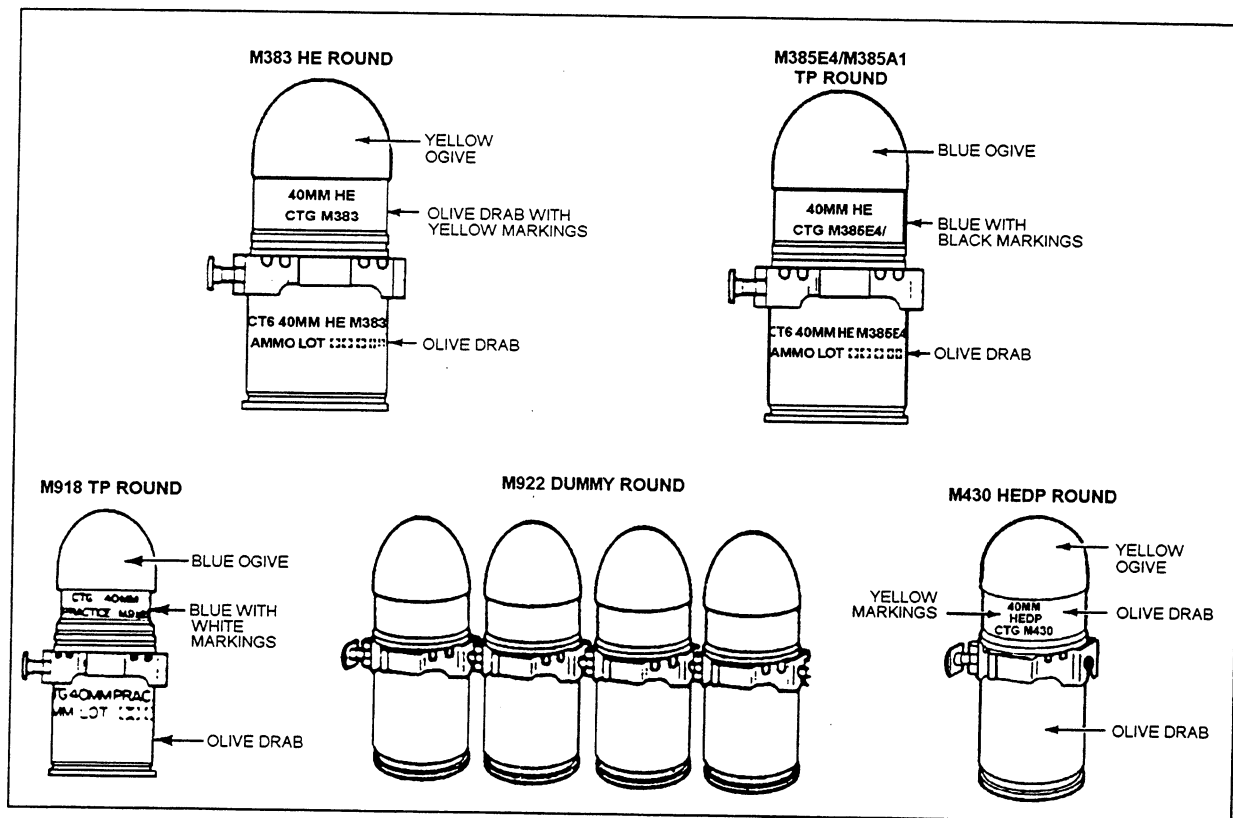


Figure 13-56.—MK 19 MOD 3 ammunition.

## AMMUNITION

### M383 HE ROUND (fig. 13-56)

- A high-explosive (HE) grenade
- Designed to inflict personnel casualties
- Arming Distance: 18 to 36 meters
- Wound Radius: 15 meters

### M385E4/M385A1 TP ROUNDS (fig. 13-56)

- Training practice (TP), inert rounds with a propelling charge

- Muzzle Velocity: 244 mps
- Maximum range: 2200 meters

### M918 TP ROUND (fig. 13-56)

- A target practice round with flash signature
- Muzzle Velocity: 244 mps

- Maximum Range: 2200 meters
- Arming Distance: 18 to 30 meters

### M922 DUMMY ROUND (fig. 13-56)

- Totally inert
- Used to check gun functioning and for gun crew training

### M430 HEDP ROUND (fig. 13-56)

- A high-explosive, dual-purpose grenade
- Arming Distance: 18 to 30 meters
- Kill Radius: Approximately 5 meters
- Wound Radius: Approximately 15 meters
- Muzzle Velocity: 244 mps
- Maximum Range: 2200 meters